SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLIII.—No. 11. [NEW SERIES.] NEW YORK, SEPTEMBER 11, 1880. [$3.20 per Annum. [POSTAGE PREPAID.]

POINT BRIDGE, PITTSBURG, PA.

We give an engraving of the Point Bridge over the Monongahela River, at Pittsburg, Pa., built by the American Bridge Company, from the designs of Mr. Edward Hemberle, one of the engineers of the company.

Pittsburg is eminently a city of bridges—necessarily so on account of the three large rivers flowing through her limits. While some of them are of humble pretensions, others will compare favorably with bridges to be found anywhere. The Point Bridge was formally opened on March 31, 1877.

The structure is the first example of a stiffened chain suspension bridge of long span, and differs considerably from others in existence. The chain is designed as a catenary, and takes up all the permanent load of the structure without bringing strains on the stiffening trusses. This object was accomplished by erecting the bridge completely before connecting the ends of the straight top chords to the center joint. The tie rods are provided with turn buckles, and are so adjusted as to be strained under moving loads only. When the bridge is half loaded, the top chords of the trusses on the loaded side is in compression, and of the unloaded side in tension. The maximum strains for the different members of the trusses occur under different positions of the moving load.

There are lateral and vibration braces between the top chords, and also between the chains, proportioned to take up the strains from wind pressure upon chains and trusses. The floor is 34 feet wide between the stiffening girders, which are 8 feet high, forming the hand rails. The stiffening girders have expansion joints every 100 feet, and are suspended from the chains by flat bars 20 feet apart. At the expansion joints there are struts instead of suspenders, in order to make a rigid connection between the roadway trusses and the chains. Cross girders 3 feet in depth connect the stiffening girders every 20 feet, and support two lines of iron stringers. These stringers and the roadway trusses form the bearers across which are placed the wooden joists for the flooring.

The lateral stiffness of the floor is secured by a double system of tie rods, and the wind pressure is taken up by horizontal steel wire cables, placed under and connected to the floor.

The towers are entirely of wrought iron, except the bases of the columns. The columns are 30 inches square each, are connected by lattice bars and form the tower. The chains are carried over the top of the tower on wrought iron chairs or saddles, which are movable on rollers to allow for expansion and the elongation of the back chains under strain.

The bridge is proportioned for a moving load of 1,600 lb. per lineal foot, under which, together with the weight of structure, the chains are strained to 12,000 lb. per square inch, sectional area. The suspenders and roadway members are strained only from 8,000 to 10,000 lb. per square inch. The maximum compressive strains in the towers are 9,000 lb. per square inch.

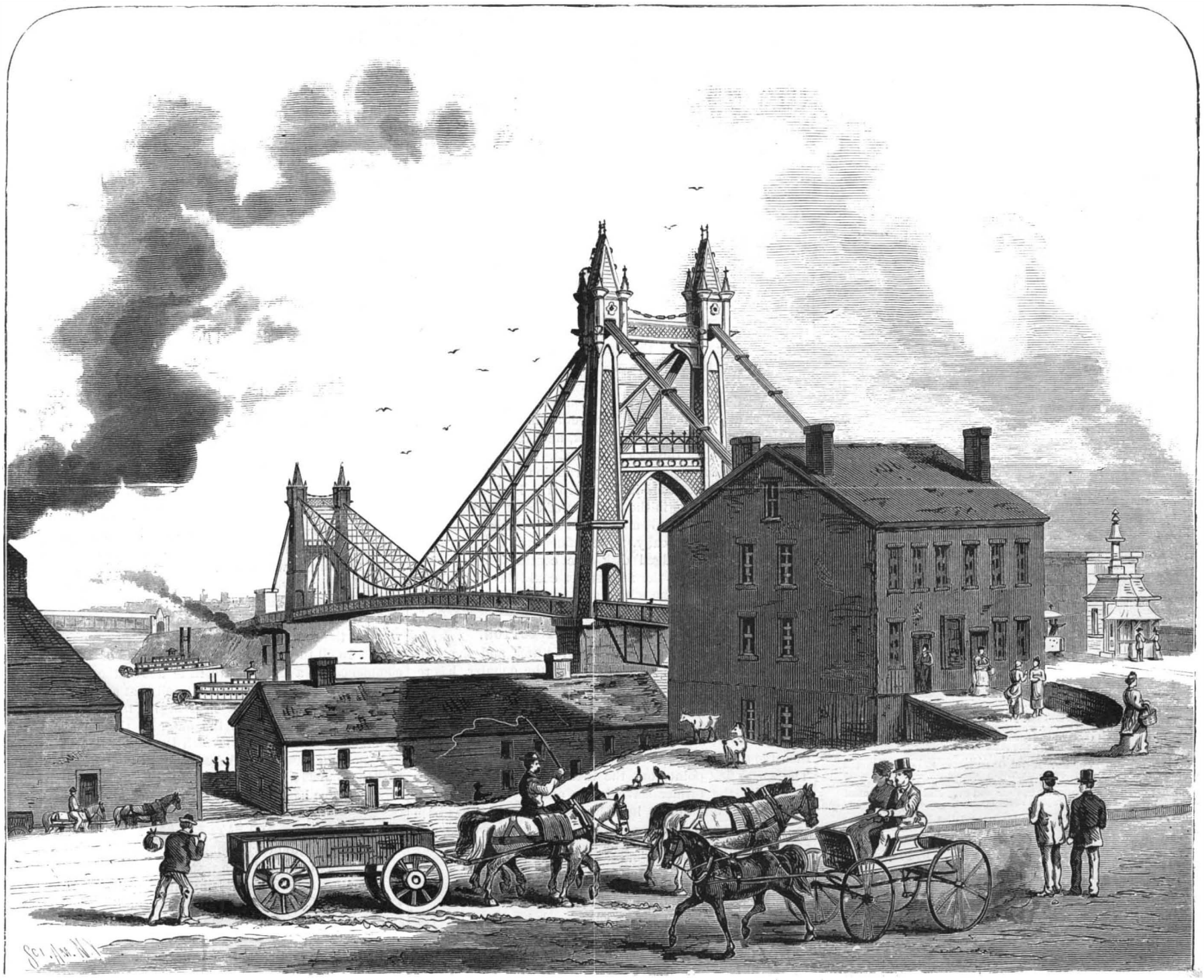
The bridge consists of three spans. The center span is 800 feet and the end spans 145 feet each—the total length from back to back of the anchorage being 1,245 feet. The roadway rises from each end, and at the center of the channel is 83 feet above low water. The saddles on top of the towers, upon which the chains rest, are 180 feet above low water, and the deflection of the chain is 83 feet. The floor is divided by iron hand rails into a 21 foot wagon way, and two 6½ foot sidewalks. The piers are built of Baden sandstone laid in cement. There are two chains, one on each side of the bridge. The links are formed of from eleven to fourteen bars, 20 feet long and 8 inches by 2 inches to 8 inches by 1 inch in size, and are connected by 6 inch pin bolts, the same bolts also connecting the links.

The material used: Timber in foundations, 4,442 feet, board measure; masonry in anchor walls, 10,868 cubic yards; masonry in piers, 7,507 cubic yards; iron in foundations, 12 tons; wrought iron in superstructure, 2,084 tons; cast iron in superstructure, 52 tons; steel in superstructure, 32 tons; timber in superstructure, 810,000 feet, board measure; number of links in the chains, 1,832.

The cost of the bridge was $525,000, and although it was erected by a Chicago company, nearly all the ironwork was done by Graff, Bennet & Co., of Pittsburg.

The Fastest Trotting on Record.

The fast trotters, Maud S and St. Julien, both surpassed the best time on record for one-mile heats, at Rochester, N. Y., August 12. The time was 2 minutes 11¾ seconds. This wonderful speed was exceeded August 27, at Hartford, Conn., by St. Julien. Distance, one mile; time, 2:11¼.



THE POINT BRIDGE PITTSBURG. PA.—BUILT BY THE AMERICAN BRIDGE COMPANY.

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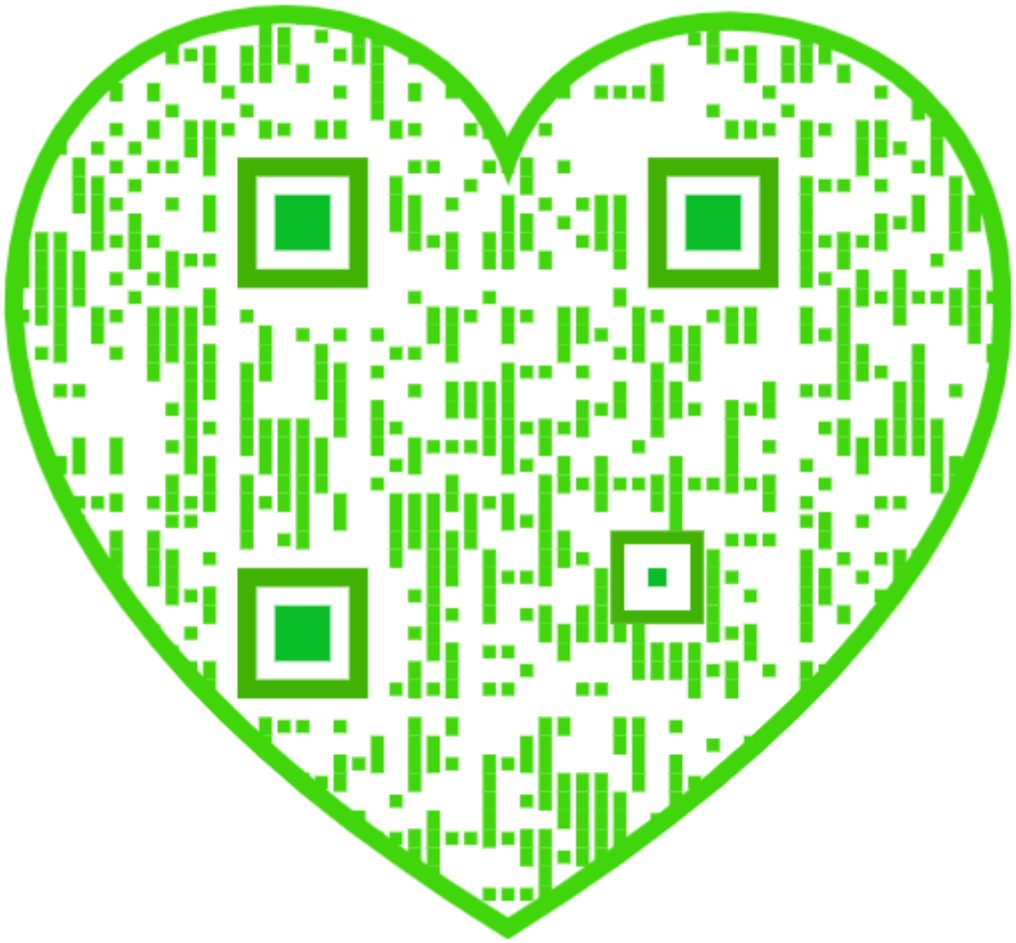

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... $3 20
One copy, six months, postage included 1 60

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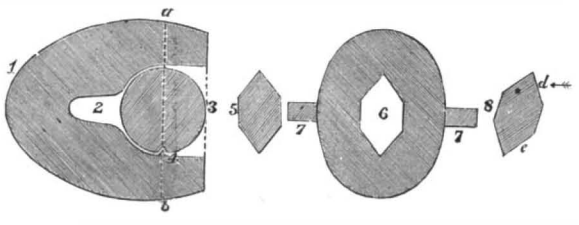
A NOVEL PROJECTILE.

A radically new type of cannon shot has been proposed by a general in the British army, to meet the novel conditions of penetration necessitated by the monitor-type of war vessels. However modified in details of construction the war ship of the present conforms more and more to the monitor principle, in the submergence of the hull and its protection by means of armored sides sloping at an angle calculated to send projectiles glancing off harmlessly; and the indications are that the war ship of the future will always present a turtle back to the enemy's guns, rather than the high vertical sides of the old style of ships.

Against armor of this sort but little is gained by increasing the weight of projectiles and the range of guns. The cylindrical bolts, spirally rotating, may be irresistible when fired against a vertical target; but they are hurled in vain against a ship with no sides to batter. Accordingly, General Hutchinson proposes, in the current issue of *Macmillan's Magazine*, a projectile having a disk-like form and a vertical rotation. Instead of glancing from a flat-armored ship, or from water, such a shot must of necessity maintain its line of motion; and with heavy shot no slope however slight given to armored decks or bottoms could save them from penetration. With the rotation of an advancing carriage-wheel the upper edge of the projectile, on striking a ship's bottom, would receive an impulse upward and crash through any double bottom or cellular compartments. With the reverse rotation the lower edge would receive an impulse downward, and the whole momentum of the projectile would be brought to bear like a heavy circular saw upon the deck impinged upon.

The rotation to be given to the projectile is determined by the position of the catch in the muzzle of the gun, as shown at 4 in the accompanying engraving. No rifling of the gun is required for such a projectile, and all the surfaces of the disk are therefore smooth, so that there is nothing to check rotation in the longest flights. Another advantage claimed arises from the shortness and corresponding lightness of the gun required for this projectile. The disk rolls out of the gun unretarded by rifling; there is little or no recoil of the gun; the initial velocity of the shot is great, since it does not have to drive out a column of air packed before it; and with its sharp edge, and little or no vacuum in its rear, the shot is calculated to have long-sustained velocity. That the rotatory motion must be preserved is shown by results obtained by a small experimental gun.

For land use General Hutchinson proposes a projectile of any shape having the rotation of an advancing wheel—"a projected mitrailleur, effective at an immense distance, discharging its bolts with a horizontal trajectory without destroying its efficiency as a rapidly rolling shot"—to be composed of "many laminæ loosely hung on an axle (coned from the center), which, separating during their vertical flight and whirling rapidly along the ground, would prove most destructive to cavalry and infantry."



The construction of the gun and the projectile will be made clear by the engravings. The reference figures indicate:

(1.) Vertical longitudinal section of gun. (2.) Powder chamber. (3.) Section of disk projectile through major axis. (4.) Notch in circumference of disk, and catch in muzzle. (5.) Section of disk through minor axis. (6.) Transverse section of gun through *a b*. (7.) Trunnion. (8.) Section of disk through minor axis inclined from a horizontal plane. A side wind blowing in the direction of the arrow acts more forcibly against *d* than *e*, and therefore tends to make the disk travel more vertically. The influence of a side wind on a flat-sided, round-edged disk (the central section of a sphere) would be just the reverse, as could be exemplified by throwing a flat stone with a spin.

STRIKING FIGURES ABOUT COTTON.

A prominent New England manufacturer, and the foremost authority on cotton statistics in the country, has recently written a letter giving some figures as to the growth and probable future development of the cotton industry, which are almost startling, and, coming from any less trustworthy source, would seem rather the dreams of a visionary than the sober conclusions of a well-informed business man. The writer first points out the increased product with free as against the former slave labor, and says: "The very habit of the cotton plant itself has been altered; it has been forced to mature earlier, and been made more prolific, and stronger to resist its insect enemies," so that, with probably a less number of laborers in the cotton fields now, the production is greatly in excess of what it formerly was, that of the present year being estimated as "at least 25 per cent in excess of the largest crop ever raised by slaves." The writer then says that from 6,000,000 bales of cotton fiber, after deducting enough seed for the next year's planting, there will remain 3,000,000 tons of seed, which, "if treated as a small portion is now treated," will yield about 90,000,000 gallons of oil, about 1,300,000 tons of oil-cake or meal, and hulls which it is thought may be profitably worked into "750,000 tons of paper," although, if these hulls be worked into the meal, they will serve as so much food for stock. The writer then figures out the possible proceeds, as an actual addition to the wealth of the country, of "the almost unrealized portion" of our present cotton crop in figures which seem almost startling, and says that "there never was so great a field suddenly opened for the introduction of new tools, new cotton gins, new presses, and for every variety of implements and processes."

Indeed, the principal object of the writer is to urge upon manufacturers and the public the importance of holding a great international exhibition, exclusively devoted to cotton. But why may not such an exhibition be held in connection with the great Fair which we are to have in New York in 1883? This city many years ago drew the great bulk of the cotton business from Boston, and is now the great mart of the country for productions in that line. It would probably require as large a building as we had in Machinery Hall at the Centennial to make a complete display of cotton machinery alone, but if the cotton manufacturers were all to enter earnestly into such a plan we cannot imagine any other one object to which so much space might profitably be devoted, and no one which would so readily command liberal contributions from New York merchants. Such an exhibition, if it gave, in the machinery shown, a sort of history of the growth of improvement in the cotton manufacture, would afford at once a help and a powerful incentive to further inventions and discoveries, whereby this large and at present "almost unrealized portion" of our cotton crop might be turned to profitable account, and nowhere else could the judgment of experts and the help of capitalists be so surely depended upon. We therefore earnestly commend this subject to the careful consideration of the Board of Commissioners who are now making the preliminary arrangements for the Exhibition of 1883.

The proposer of this plan of a comprehensive cotton exhibition puts his argument briefly as follows: "One or two men in agriculture (cotton raising), one in preparing and transporting, one or two women in spinning and weaving, are equal to the production of cotton cloth to meet the need of 1,000 to 3,000 inhabitants of the various parts of the world; yet this great force, this factor in commerce almost as potent as gold, and more so than silver, at the present day has had but the most meager attention. It needs now a place in which all new inventions may be concentrated." Inventors may know from the above something of the extended field which is before them as connected with this branch of business, and, although many very important improvements in the cotton manufacture have been made by American mechanics, the opportunities for a careful examination of machinery are not sufficiently general to promote that wide emulation which such an exhibition would invite and encourage. "The air is full of new efforts, new devices," says our author, to meet the needs of this industry, so let us by all means have such an exhibition, so that inventors can learn what has been done, and all join in the effort to bring out what is wanted.

A CURIOUS PHYSICAL PHENOMENON.

A curious physical phenomenon has, says *Nature*, been lately described by Dr. Grassi in the Proceedings of the Royal Institute of Lombardy. An apparatus is formed of three concentric vessels with an annular space of about two centimeters between the first and the second, and the second and the third. The outer space is filled with oil, and the next with water. The oil is heated by a gas furnace to a little over 100°, and the water boils. Then hot oil at, for example, 150°, is poured into the central space. This quickly cools to a temperature close to 100°. Dr. Grassi found that the central oil cooled more rapidly the higher the temperature of the outer oil; and with more delicate apparatus (in which the vaporized water was conducted and returned, and the outer oil kept at any requred constant temperature) he arrived at definite numerical results, which he tabulates. With the outer oil at a mean temperature of 129·9°, for instance, the time of cooling of the inner oil from 130° to 110° was 49 seconds; when the former was 105·1°, the latter was 57 seconds. Alcohol and ether gave more decided results. The maximum difference was obtained with ether; the outer oil being at 57·5°, the inner took 25 seconds to cool from 57° to 50° (7°); whereas the former being 39·3°, the latter became 39·5 seconds. In all the experiments the cooling of the inner oil commenced at a temperature little above the maximum of the external oil. When the outer oil is at a higher temperature, at a certain point the heat begins to prevail, which is transmitted directly from the outer to the inner oil. An analogous phenomenon (to which Dr. Grassi refers) was that of some members of the Accademia del Cimento, who found that the water in a vessel surrounded by ice cools more rapidly if the ice be heated to accelerate fusion.

DO PATENTS PAY?

The Washington correspondent of the Chicago *Times* has been making inquiries with respect to the benefits derived by inventors from patents, being incited thereto by a statement to the effect that not two patents in the hundred ever return to the applicant the amount of the government fees. On the authority of Mr. Arthur W. Crossley, chief of the issue division of the Patent Office, who for the past two years has made a special study of the value of patents, the statement above quoted is pronounced wholly unjustified by

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facts; and Mr. Crossley's testimony will be abundantly substantiated by all who have had much to do with patent rights. Mr. Crossley refers to the weekly list of patents issued for evidence that a large part of them are assigned wholly or partly to manufacturing companies. In other words, the practical worth of the patents has been demonstrated, and Mr. Crossley has found, upon inquiry, that in nearly all cases the assignors obtain a good price for their inventions. He adds:

"Whenever I have had an opportunity to inquire of inventors as to the success they have had with their patents, the general testimony has been that the inventors have made something satisfactory out of their patents. A number of years ago, Secretary of the Interior Thompson caused an inquiry to be made in this same matter, and it was reported that the value of patents issued would average about $10,000 each."

When it is borne in mind that to a large extent patents are taken out to cover and protect devices and processes which are, so to speak, stepping stones to final inventions which alone are to be practically applied, this high average value is very significant. Then there must be taken into account the large number of inventions which the makers do not develop, not because of inherent worthlessness, but because the inventor's attention is turned to something else. In all such cases the patents pay indirectly in securing the registration and accurate description of the inventions, by which means they become a permanent part of the common stock of practical knowledge.

THE CONCORD SCHOOL OF PHILOSOPHY.

The *Christian at Work*, alluding to the closing of the recent session of the Concord School of Philosophy, rather sneeringly suggests that no new problems were solved nor any new impulse given likely to lift the moral world out of its orbit. The editor further says that he believes it was Mr. Joseph Cook who pronounced Mr. A. Bronson Alcott "the modern Plato." Perhaps he meant the Concord Plato. Every New England village is supposed to have a Plato, and, for all we know, a Socrates as well. But hemlock is not drunk now as freely as it was, and the modern Socrates is not as anxious as his ancient prototype was to be rid of the prison house of his body. It must be a very happy thought to a New England philosopher to imagine himself going down to his grave a nineteenth century Plato. Still, we fear the Phædo will be read when the Concordia is forgotten; and if a modern Plato usurps the olden one in public regard, it will be when English is a dead language, when the theories of its pronunciation are as many as the stones of Trinity spire, and when that New Zealand itinerant shall wander among the ruins of the New York Post Office and puzzle over the lost order of American architecture, or, mayhap, some antiquarian shall puzzle over a translation of a poem of Emerson's, and search in vain for the key to the unsolvable enigma.

TIN IN MAINE.

Among the mining interests just now showing signs of early and profitable development in Maine, not the least in importance is that connected with tin. The country has no lack of mines of gold, silver, copper, and lead; and if any failure should occur in those now opening in Maine, it is not likely that many besides their particular owners would be conscious of the deficiency. Nor is it likely that any great or radical effect would be wrought upon the general industries of the country, should the yield of these metals in Maine prove as generous as the most enthusiastic miners there anticipate.

With tin the case is different. For that metal we are obliged to go abroad, chiefly to England, and so long as England controls the market for tin, there is little hope of our wresting from her the larger traffic in tin plate. The development of tin mining at home to a degree sufficient to secure the practical independence of our vast industries employing tin and tinned iron would be worth much more to the country, indirectly if not directly, than any mine of gold or silver. Accordingly it may be safely said that the announcement of the discovery of extremely promising deposits of tin ore in Maine is likely to awaken a heartier interest throughout the country than any other mining reports from that land of mining booms. If any of Maine's mineral products fail, it is sincerely to be hoped that the failure will not be in tin.

Indications of tin were discovered in Maine some ten years ago; but then it was the popular belief that Maine was not nor ever could be a mining State. Recent explorations in the town of Winslow, on the Kennebec, a few miles above the State capital, have discovered half a dozen metallic veins of rich tin ore, in a rock formation precisely like those in which tin is found in Cornwall, Germany, and New South Wales.

As described by Professor C. H. Hitchcock, the rock which incloses the tin ores of Winslow is a mica schist or killas, associated with somewhat calcareous layers, and adjacent to a hard quartzite band, called an *elvan* by miners. Thirty feet width of vertical sheets of killas show twelve granite veins from half of one inch to three inches width, crossed, occasionally, by stragglers. These veins are full of crystals of tin ore (cassiterite) with the associated minerals fluorspar, margarite, mispickel, beryl, lepidolite, etc. The mineral, geological, and physical feature of the Winslow mine are, Professor Hitchcock adds, "identical with those common to the stanniferous districts of Europe," and "the ore seems to be sufficiently abundant to remunerate quite extensive outlays for mining operations."

Professor Forrest Shepherd describes the mineralized belt at Winslow as from thirty to forty or more feet in width. In a shallow pit where it has been uncovered five or more veins appear within a space of eight feet, a promise unequaled in any Cornwall or Saxony mine. And what is particularly encouraging, the Winslow deposits are, at the surface, equal in quality, Professor Shepherd says, to the best in Cornwall, and in a series of veins most favorably situated, while in Cornwall and elsewhere the veins are rarely remunerative except at great depths.

A company has been formed to develop the Winslow mine and to extend the exploration for tin in other parts of the State. The prospect of success is, to say the least, very encouraging. Should the yield prove abundant a particularly favorable opportunity would seem to offer for the manufacture of tin plate in that State, owing to the abundance of suitable iron ore and the proximity of forests for supplying the charcoal required to smelt it.

THE AMERICAN SCIENCE ASSOCIATION.

The twenty-ninth meeting of the American Association for the Advancement of Science began in Boston, August 25. The meeting was called to order by the retiring President, Prof. Geo. F. Barker, of Philadelphia, who immediately resigned the chair to the President-elect, the Hon. Lewis H. Morgan, of Rochester. President Rogers, of the Massachusetts Institute of Technology, delivered an introductory address, which was followed by addresses of welcome by Mayor Prince and Governor Long.

The secretary reported the deaths for the past year as follows: George W. Abbe, New York; E. B. Andrews, Lancaster, Ohio; Homer C. Blake, New York; F. A. Cairns, New York; Caleb Cooke, Salem, Mass.; Benjamin F. Mudge, Manhattan, Kan.; Thomas Nicholson, New Orleans; Louis Francis de Pourtales, Cambridge, Mass.

A committee was appointed to draft resolutions on the death of Gen. Albert J. Myer, and another to send by cable the cordial greetings of the Association to the British Association at Swansea, on the occasion of its fiftieth meeting.

The general session was then adjourned, and the various sections and sub-sections organized. In the afternoon, Section A was addressed by Prof. Asaph Hall, of Washington, who reviewed the recent advances in the science of astronomy, and the services rendered by men who, like Fraunhofer, have aided the work by optical and mechanical skill.

In the sub-section of chemistry, Prof. John M. Ordway reviewed the recent achievements of practical chemistry, and discussed its methods. The sub-section of anthropology was addressed by Major J. W. Powell, on the social organization and government of the Wyandotte Indians. In the evening the retiring President, Prof. Barker, delivered the customary address, his subject being, "Some Modern Aspects of the Life Question." He took the ground that every action of the living body is, sooner or later, to be recognized as purely chemical or physical, the life that science has to deal with having no existence apart from matter.

The second day's meetings were held in Harvard College, Cambridge. The appointed eulogy on the late Prof. Henry was delivered by Prof. Alfred M. Thayer, who dwelt especially on Prof. Henry's work as a discoverer in science. The practical side of that work was touched in connection with the experiments which proved so beneficial to the lighthouse and fog-signal service. One discovery—that lard oil, when subjected to a heat of 280° Fahr., is superior to sperm oil in fluidity and illuminating power—saves the Government $100,000 a year.

Prof. Alexander Agassiz, Vice-President of Section B, followed with an address on "Paleontological and Embryological Development," choosing his illustrations from a limited group of marine animals—*zaurchins*—having less than 300 living species, and more than 2,000 known fossil species.

The rest of the day was spent in the museums, laboratories, libraries, the observatory, and other buildings of Harvard College.

The reading of the 218 papers comprised in the programme was to begin on the third day, Friday, and continues until the final adjournment on Wednesday, Sept. 1. Nearly 600 members were registered the first day, and fully 500 new members have been elected during the two days completed at this writing.

MINING DEBRIS IN CALIFORNIA.

The California Mining Debris Commission, with Capt. J. B. Eads as consulting engineer, have lately gone over the Yuba River country to consider the plans proposed for the disposal of mining debris. If correctly reported, Capt. Eads favors the construction of brush dams rather than those of stone, as originally recommended by the commission. In his opinion, a series of brush dams across the river would entirely arrest the flow of sand and clay; and as fast as the brush is buried other layers might be added from time to time, gradually raising the height of the dam until the catchment basin is full.

A dam of this sort is proposed about eight miles above Marysville, where there is tolerably high ground on opposite sides of the valley. The plan contemplates the building of a brush dam nearly two miles long and seven or eight feet high to begin with. This dam would catch and hold a large quantity of debris, and become buried and strengthened by the deposit. From time to time additions would be placed upon top of the new foundation thus formed Proceeding up the river, the banks become higher, forming a broad and deep area between them for storage of matter to be checked by the dams. From this lower dam to the foot of the dumps from the mines there is an area of seven square miles to be filled by the debris, and were it filled to the depth of forty feet at the upper end it would not interfere with mining operations. Two miles higher is Point Du Guerre, a rocky point about sixty feet high, and extending into the canon or valley some distance. From this point to a higher one across the river it is proposed to extend the second dam, the length of which will be nearly a mile. Beginning with brush loaded with rock, and adding new material as it may be needed, a dam forty feet in height can safely and cheaply be built up. An abundance of willows can be cut for the dams along the river side, and Capt. Eads has great confidence in their efficiency for the work required. Below the dams, where the river banks are defective, brush wing dams will easily keep the current in place; and, with the stoppage of dams above, the concentrated water will quickly cut out a single deep channel.

Albert J. Myer.

Brigadier-General Albert J. Myer, Chief Signal Officer, Unites States Army, familiarly known as "Old Probabilities," died at Buffalo, N. Y., August 24.

General Myer was born in Newburg, N. Y., Sept. 20, 1828. He was graduated at Geneva College in 1847, and in 1851 received the degree of doctor of medicine from the University of Buffalo. In 1854 he was appointed assistant surgeon in the army. While on duty on the Texan frontier, where a clear atmosphere and broad reaches of plain offered superior facilities for signaling by vision, his attention was drawn to the possible advantages of a system of sight signals in military and naval operations. The result was the preparation of a "Manual of Signals for the United States Army and Navy," which was published in 1858. During the next two years he was engaged in developing a special signal service for the army, becoming Chief Signal Officer in 1860. His service during the war was brilliant and vitally important, and his advancement was correspondingly rapid. One of the most dramatic episodes of the war was the saving of Allatoona, Ga., in 1864, by bringing up troops by signals in time to relieve and defend that valuable post, the messages being sent over the heads of the enemy.

After the war General Myer introduced a course of signals at the naval and military schools at Annapolis and West Point, and was largely instrumental in establishing telegraphic communication with military posts on the extreme frontier, 5,000 miles of telegraph lines having been built under his supervision. In the spring of 1870 he was, by Act of Congress, charged with the special duty of developing a national system of meteorological service, which was accomplished within a year. The success of this system under his admirable management has led to the establishment of a uniform international system of simultaneous meteorological observation over nearly all the northern hemisphere; arrangements being made at the International Meteorological Congress at Vienna in 1873, for the exchange of one report of observations taken daily at the same instant over all the United States, nearly all of Europe, Northern Asia, and Northern Africa. It is seldom that a work begun by one man grows under his own supervision into a service of such far-reaching and comprehensive usefulness.

The Kelley Run Colliery Fire.

The attempt to quench the fire in the new slope of the Thomas Coal Company, near Shenandoah, Pa., by sealing the outlets and forcing in steam, has failed. The mine caved in August 24, and to all appearances the fire is beyond control. The alternative plan for quenching the fire with carbonic acid gas and nitrogen, undertaken by a Pittsburg firm, has also been abandoned, the flames having secured so large an opening to the outer air that there seems no possibility of cutting off the supply of oxygen.

A Rude Tramway.

Seven miles of log track are being laid at Essex Center, Ontario, connecting four saw mills with timber cuttings in the woods. The road is made of small trees, stripped of their branches, and laid end to end, like rails. Four cars are being built for the road, the rim of the wheels being concave, so as to run on the track, and the axles turned longer than the hubs of the wheels to allow play for any unevenness. The trains will be drawn by a steam locomotive.

Hollow Ground Razors.

It is not long since it was confidently asserted that, even if the required quality of steel could be produced here, the United States could never compete with England in the manufacture of razors and other fine cutlery, owing to the excessive cost of grinding and finishing. Like a good many other "insuperable" obstacles to American success in the arts, this seems to have been pretty well overcome, since large quantities of Sheffield razor "blanks" are now sent here expressly to be finished. It seems that the art of "hollow grinding," German style, requires a degree of skill a little beyond that of the Sheffield workmen. Accordingly Sheffield manufacturers have to pay double freight across the Atlantic to secure the fine finish to their razors that the trade now demands.

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The Habit of Self-Control.

If there is one habit which, above all others, is deserving of cultivation, it is that of *self-control.* In fact it includes so much that is of value and importance in life, that it may almost be said that, in proportion to its power, does the man obtain his manhood and the woman her womanhood. The ability to identify self with the highest parts of our nature, and to bring all the lower parts into subjection, or rather to draw them all upwards into harmony with the best that we know, is the one central power which supplies vitality to all the rest. How to develop this in the child may well absorb the energy of every parent; how to cultivate it in himself may well employ the wisdom and enthusiasm of every youth. Yet it is no mysterious or complicated path that leads to this goal. The habit of self-control is but the accumulation of continued acts of self-denial for a worthy object; it is but the repeated authority of the reason over the impulses, of the judgment over the inclinations, of the sense of duty over the desires. He who has acquired this habit, who can govern himself intelligently, without painful effort, and without any fear of revolt from his appetites and passions, has within him the source of all real power and of all true happiness. The force and energy which he has put forth day by day, and hour by hour, is not exhausted, nor even diminished; on the contrary it has increased by use, and has become stronger and keener by exercise; and, although it has already completed its work in the past, it is still his well-tried, true, and powerful weapon for future conflicts in higher regions.—*Phila. Public Ledger.*

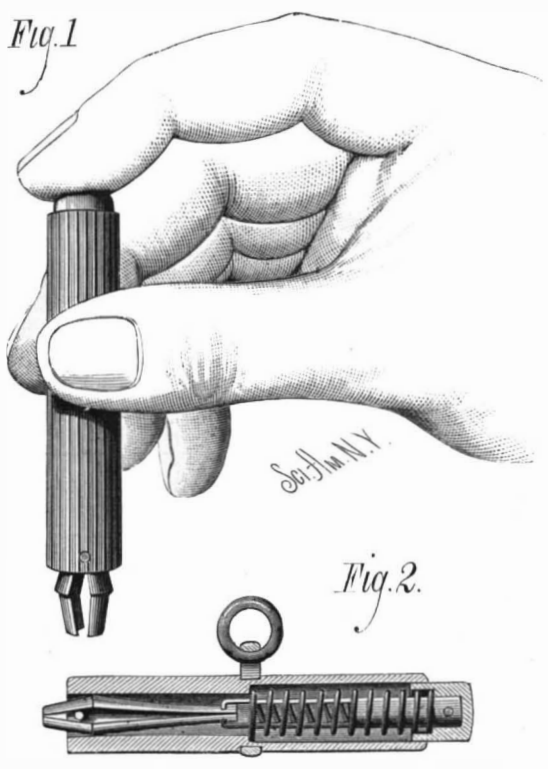
SELF-ADJUSTING WATCH KEY.

With few exceptions no article is more universally used than the watch key, and it is singular that an article even as simple as this should have been used for centuries without some improvement. It is only recently that any real improvement has been made in this direction. Our engraving represents an adjustable key—one that will wind any watch—which is manufactured by Messrs. J. S. Birch & Co., 38 Dey street, New York.

The engraving shows the construction and manner of using this key so clearly that scarcely a word of explanation is required. The instrument consists essentially of a pair of griping jaws held in the forked end of a spindle arranged to slide in the tube. The end of the spindle is attached to a cap, which slides in the tube and is pressed by a spiral spring resting on a shoulder in the tube. The tendency of the jaws is to spring apart, so that when the cap is pressed downward, so as to project the jaws from the tube, they are separated more or less. While in this position they are placed on the arbor to be turned, the cap is then released, and the jaws clamp themselves tightly on the arbor. The jaws are prevented from twisting or turning in the tube by a pin passing transversely through the tube between the jaws.

As to the usefulness of this invention it is only necessary to say that the key will fit any watch, and will not only answer the purpose of winding and setting the watch, but it will fit the abors perfectly, thus avoiding the wear of these parts, a thing unavoidable when common keys are used.

This key is absolutely proof against the danger of conveying dust to the movement. By springing the jaws open all



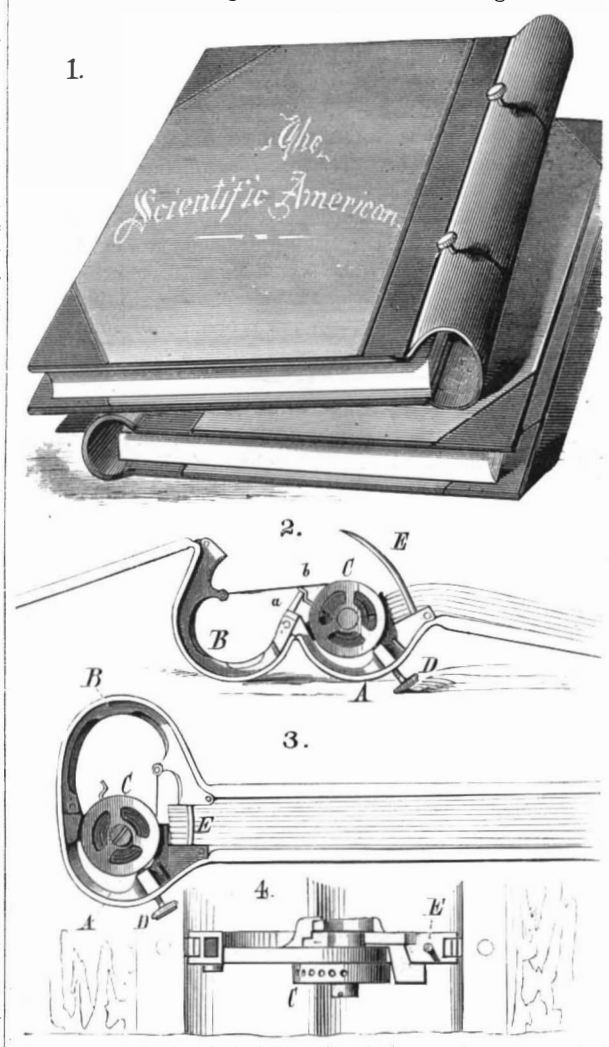
BIRCH'S SELF-ADJUSTING WATCH KEY.

accumulations in the pipe or jaws of the key are at once expelled. All the adjustable parts are made of the best tempered steel, and the shells are substantially mounted in a large variety of ornamental designs (some 37 in number), which render them appropriate and attractive charms to be worn on watch chains.

Full particulars may be obtained by addressing the sole manufacturers as above.

A NOVEL BINDER.

The engraving shows a new binder for binding newspapers, pamphlets, letters, bills, etc., recently patented by Mr. William Keenan, of 79 St. George street, Toronto, Ontario, Canada. Fig. 1 is a perspective view representing the exterior of the binder; Fig. 2 is an end view showing the back



KEENAN'S BINDER.

of the binder open and ready to receive papers; Fig. 3 is an end view showing the back closed, and Fig. 4 is a detail view of the fastening mechanism.

The binder has two covers connected by a back of leather, and also by jointed metallic frames, A B. The part, B, of each frame has a cam, *a*, which is engaged by a spring, *b*, on the part, A, when the binder is opened to receive a paper, and holds it open while the paper is being placed on the curved needles, E. The two parts of the jointed frames are drawn together as the binder is closed by springs in the drum, C, turning on a stud projecting from the part, A, of the jointed frame. The drum carries a band or piece of watch spring, which is attached to the opposite half of the frame, and serves to draw the two parts together. The part, B, is made hollow to receive the needle, E, and a milled screw, D, passes through the frame and enters one of several small cavities in a rim attached to the drum, C, to keep it from turning.

The articles to be filed are placed upon the curved needles when the device is arranged as shown in Fig. 2; then by closing the two halves of the back the spring, *b*, is released from the cam, *a*, and the spring in the drum, C, holds the binder closed. To secure it still more firmly the screw, D, may be brought into use.

It will be seen that no thread is used in this binder and that threading is consequently avoided. The covers may be opened wide and will be flat, and the papers can be easily referred to and read.

American Machines in England.

In his recent address before the Institution of Mechanical Engineers, President Cowper said:

"Sewing machines ought to be made here, and I urged English makers, years since, to go in thoroughly for making every part accurately and by machinery, so as to fit together at once without 'fitting;' but I could not get this carried out, and now sewing machines come from America literally by millions, though labor is dearer, metal is dearer, and there are upwards of 3,000 miles of carriage against them. But 'machine manufacture' is cheaper and better than 'hand making.'

"In gun making I counseled some of the Birmingham makers, years before they did anything in the matter, that they would actually lose their trade if they did not adopt good machinery to manufacture every part exact to size; and at last, when the government had the means of doing most of the work, they did adopt machinery, but many years too late.

"Then with regard to common pumps, they are now imported from America by thousands, and are sold here, without being commonly known to be American; clocks and watches also come in immense numbers, some of them very cheap and common, while others are very well made.

"Another trade, nearer perhaps to most of us, is that of rolled iron girders, which, I am sorry to say, are coming by hundreds and thousands from Belgium; indeed, almost every house that is now built in London with rolled iron girders is supplied from Belgium. These things should not be; we have iron in plenty, and labor in abundance, but we want special machines, schemed as fast as they are wanted, to fit the work properly, and turn it out accurately in large quantities; and we should show more enterprise in adopting a good 'new thing,' which I am sorry to say is what some of our old-fashioned manufacturers are slow to do, often little knowing how they damage the trade they are in by not adopting the best known process."

DE LOCHT'S PANTELEPHONE.

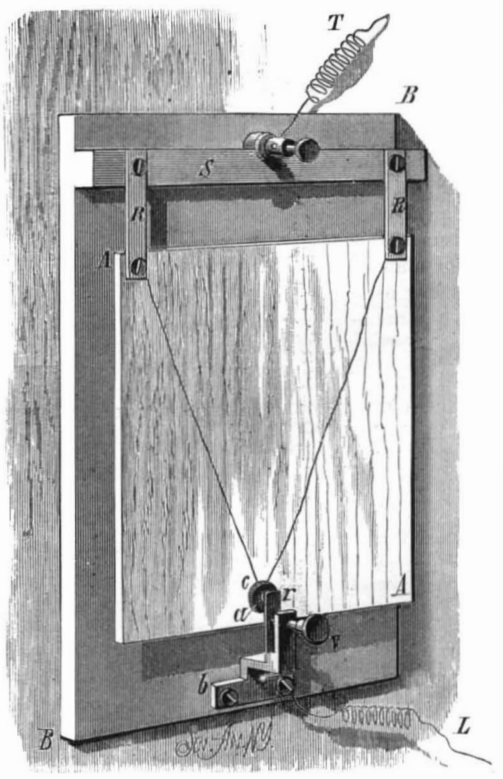
Leon de Locht, Mining Engineer and Professor at the College of Mining, Mont St. Martin 49, Liege, Belgium, after several years' experimenting with a view of overcoming the defects of the best telephones in use, and after the invention of one or two forms of apparatus, which have been the subject of patents in various countries, has finally perfected an instrument which he calls the pantelephone.

This apparatus is a microphonic transmitter which is sensitive to sonorous vibrations emanating at a great distance. It is capable of transmitting words spoken at forty-five feet from the apparatus to a distance of several miles through the medium of receiving telephones. The pantelephone, which is extremely simple, is composed essentially of a movable plate carrying a carbon contact, which presses against a disk of carbon or metal—silver or platinum.

Referring to the accompanying cut, the plate is seen figured at AA. It may be of aluminum, sheet iron, steel, brass, mica, cork, or of any substance whatever that is capable of being formed into plates of large superficial area, while at the same time possessing the requisite amount of lightness. It is preferable that its form should be rectangular, fifteen centimeters square in size, and, when made of metal, two to three tenths of a millimeter in thickness. It should be as inflexible as possible, and not liable to bend out of shape through the influences of temperature and humidity. It is suspended by two small very flexible steel springs, R R, from a support, S, which is perfectly straight and stands out from the fixed plate, B B, forming the framework of the apparatus. To the middle of the lower end of the plate is riveted or soldered a small carbon disk, *c*, which, when the apparatus is in a vertical position, rests against a small piece of silver or platinum fastened to the end of a short and somewhat inflexible spring, *r*, the latter being fixed by means of a screw, *v*, to the copper support, *b b*. By means of a thumb screw, V, passing through the support, the contact of the carbon, *c*, with the piece, *a*, may be regulated at pleasure.

The pantelephone is placed in the circuit of a voltaic pile in such a way, for example, that the current entering at L, proceeds to the support, *b b*, and from thence through the spring, *r*, to the contact, *a*, then to the carbon, *c*, and through the plate, A A, to the springs, R R, and leaves the apparatus at T.

There are other and secondary details of construction, by means of which the inventor is enabled to so regulate the apparatus as to insure of the greatest sensitiveness and of the best possible performance. There are certain arrangements employed, too, to deaden and stop all noises which might arise from tremors of the earth, or from the shaking of the wall to which the apparatus is attached. It is claimed that the pantelephone, when once properly regulated, is not liable to get out of order; and, moreover, that the expense



DE LOCHT'S PANTELEPHONE.

attending the use of the system is insignificant, since the apparatus under proper conditions requires for its making only the electromotive force of a single voltaic couple. The instrument transmits all sounds, articulate or inarticulate, which reach it, through the medium of either solids or the air. It is inclosed in a box (which may be made as ornamental as desired) in such a way that its sensitiveness to sonorous vibrations is in no way impaired.

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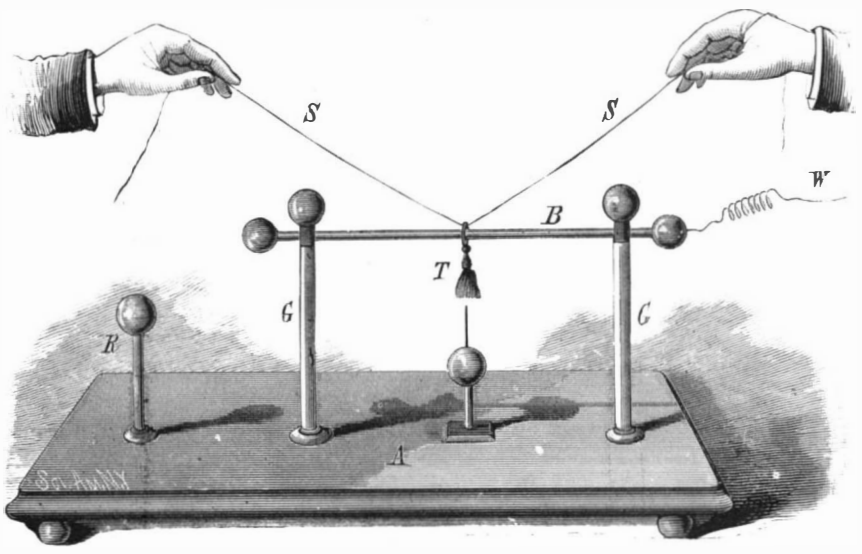
EXPERIMENT ILLUSTRATING DISCHARGE OF ELECTRICITY FROM CLOUDS.

Mr. Loudon gives the following pretty experiment in the *Colliery Guardian*. It illustrates some of the phenomena of thunderstorms:

In the engraving, A is the base of the instrument, made of wood and brass. G G are glass legs supporting an arm of brass, B. The cloud is here represented by the moving tassel, T, pulled backwards and forwards by the strings of silk, S S. O is a ball provided with a point or lightning conductor. This ball is not insulated, that is, not supported by a glass leg. W is a wire leading to an electrical machine. On working the machine electricity is spread over the arm, B. The tassel consequently diverges, owing to each filament being charged with like electricity. On drawing the tassel (cloud) over the lightning conductor, O, an opposite kind is given off at the point and neutralizes the cloud and the leaves or fibers collapse. If we were to wholly detach the tassel and work the machine till we raised a large envelope of electricity around the arm, B, a vivid flash of light (lightning) would pass to uninsulated conductor, R. If the ball, O, was not provided with a point, on moving the electrified tassel along the arm, B, it would not collapse on passing the ball, except that a faint spark was given off. If this spark took place, you have what often happens in nature.

Persons ought never to stand near a tree nor a house, nor even a building provided with lightning conductors, for shelter. My reasons are these: Wood is a poor conductor, masonry worse, and if buildings provided with these conductors are not what they ought to be, they only invite destruction.



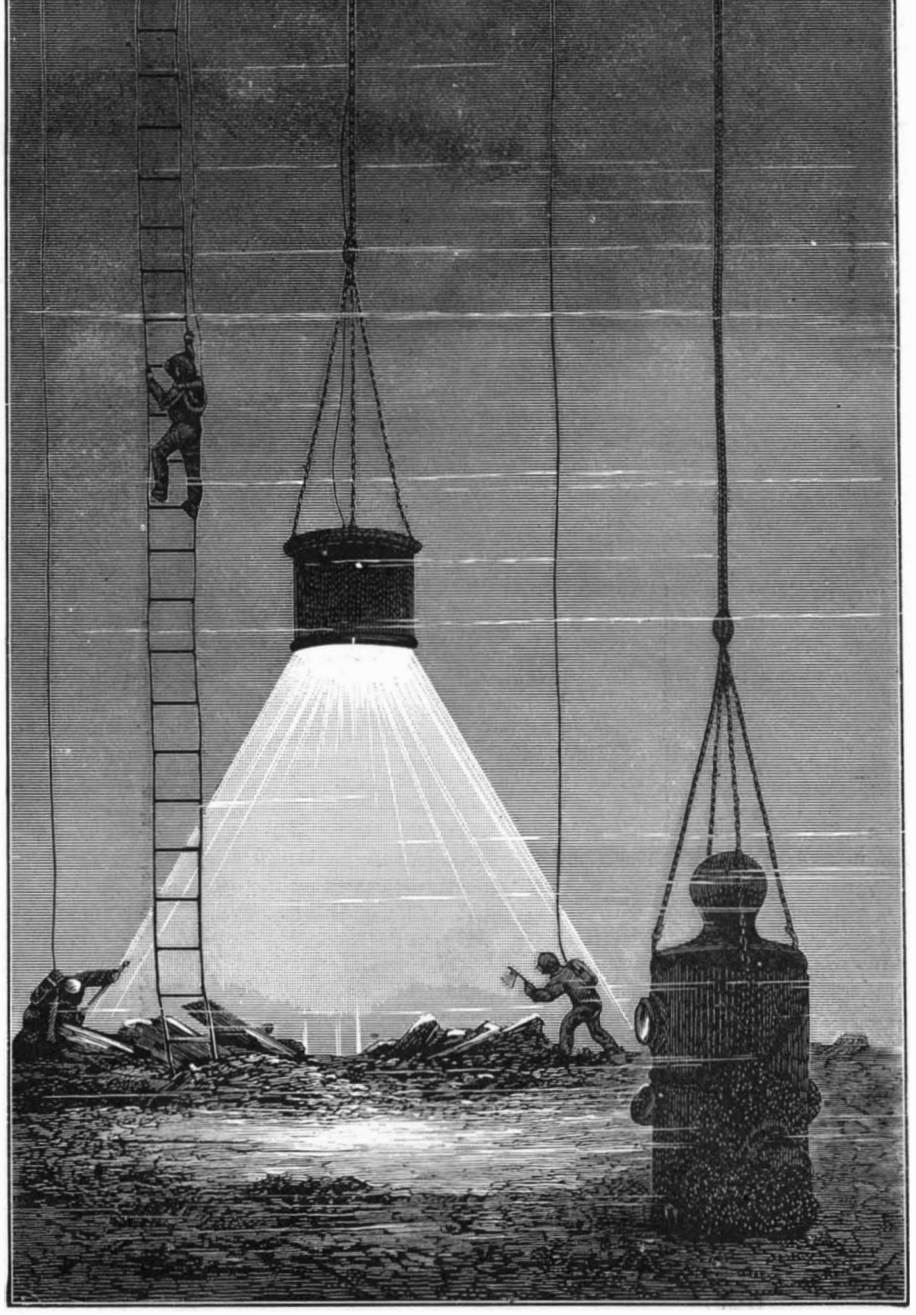
ILLUSTRATING DISCHARGE OF ELECTRICITY FROM CLOUDS.

SUBMARINE OBSERVATORY AND ELECTRIC LIGHT.

The accompanying engraving, taken from the *Leipziger Illustrirte Zeitung*, illustrates Bazin's submarine observatory and electric light, which has been found to be of the greatest service in examining wrecks, submarine foundations, etc. It was used for the first time in examining the wreck of the Confederate steamer Alabama, which was sunk off the French coast at Cherbourg. The electric light is contained in a heavy cylinder, about 4½ feet high and about 4 feet in diameter, and provided with a heavy plate glass bottom. The lower part of the cylinder contains alum water to counteract the pressure of the sea water, which increases very rapidly as the apparatus is lowered. The upper part of the cylinder contains a powerful electric lamp, the light rays of which pass through the alum water and the plate glass bottom, and lights up the bottom of the sea for a space about 100 feet in diameter.

Bazin's observatory, shown in the right hand corner of the engraving, is about 9 feet high and 2 feet in diameter. It is provided with two bull's-eye windows through which the person in the observatory can watch the divers that are at work on the wreck. As the water is an excellent conductor of sound the superintendent can converse with the divers very conveniently.

A person can remain in this observatory for about three quarters of an hour, and if any parts should break or leak he can enter the upper helmet and remain in the same from eight to ten minutes, thus allowing ample time to raise the entire apparatus to the surface.



SUBMARINE OBSERVATORY AND ELECTRIC LIGHT.

The Largest Sewing Machine.

The largest sewing machine in the world has lately been finished. It is of the Singer type. The machine weighs over four tons, and is in some respects of new design, uniting much simplicity of construction with great strength of parts. It is adapted for general manufacturing purposes of the heavier sort, although specially made for stitching cotton belting, an article which is just now taking the market as a cheap and serviceable institution for gearing and the ordinary leather belting. The material used is of great strength and toughness, and is sewed together in plies or layers, up to an inch in thickness. The belting in being sewed together is passed through heavy feed rollers some nine inches in diameter and over eight feet in length, getting stretched and pressed in the process. There are two needles at work with two shuttles, and the shuttles can be removed from the bottom without disturbing the overlying plies belting.

The rollers between which the work passes are actuated by reversible worm and cam motions, and the machine has, in addition to these roller feeds, what is known as a top feed motion, suitable for a lighter class of work.

The stitch, as in the ordinary sewing machine, can be adjusted from one eighth inch upward, and the pressure of the rollers on the work passing through the machine can be regulated at the will of the operator. The machine, which is driven by steam, has been made for a manufacturing firm in Liverpool.

More Oil Tanks Struck by Lightning.

On the 19th of August the Bradford oil regions, Pa., were visited by a severe thunderstorm which did much damage. Two oil tanks, each holding 25,000 gallons of oil, were struck at Dallas city, six miles from Bradford. Seven smaller tanks, located respectively at Parker City, Edinburgh, Steplersburg, Bullion, and Jefferson City, were also struck and burned. The loss in oil and tanks was about $100,000. Mr. Morian, telegraph operator, received a severe shock, caused by lightning running into his office on the wires.

Improved Iron Chains.

A public test of chains, made on the plan of Capt. Chas. A. Chamberlain, by the American Chain Company, of Philadelphia, lately resulted in a signal victory for the improved pattern. Mr. Charles Cramp, Mr. McCloud, Chief of the Testing Bureau of the Pennsylvania Railroad Company, Mr. Holman, Secretary of the Franklin Institute, Mr. Sargeant, of the Pennsylvania Railroad Company, Abram Barker, President of the Wharton Railroad Switch Company, and other prominent gentlemen were present.

The first test was with an ordinary chain, ⅝ of an inch in diameter, manufactured of iron from the Trenton Iron and Steel Company's works. The chain stood a strain of nearly ten tons, when it snapped at the end. The American Company's chain of the same size and weight stood a strain of 16½ tons before it was broken across the weld. Another test was made with the company's five-eighths chain to see the effect produced by the Admiralty proof test of seven tons strain. The result was that the chain showed but slight evidence of the great pressure. It was then run up to the breaking strain, which is 40 per cent greater, and still no further effect was produced. At another test the chain broke on the side with a strain of 15¾ tons. A five-eighths ordinary chain was again produced, and was snapped at the end with a strain of 9¾ tons. A one inch ordinary chain was then tested, and stood the severe strain of 29 tons before it showed any signs of separation. The chain of the American Company, however, stood a far greater test, a pressure of 42 tons—16⅛ tons more than the Admiralty—being used before a break occurred on the side. The concluding test was the weight of 15 fathoms of one inch ordinary and the same length of the American Company's chain. The former weighed 958 lb., and the new manufacture 990.

The secret of the strength of the new chain lies in the strengthening of the end of the link by taking an equal proportion of thickness from the two straight sides. This, it is claimed, so divides the strength of the link that one portion is no stronger than another, with this difference, that the link does not wear or break easily at the most important part—the end. On the other hand, the ordinary chain is constructed with equal thickness throughout, and it necessarily follows that as the two sides are more powerful than the end, the latter must give way first. The new chain has been tested by the United States Government for the last year in connection with signal buoys, and when taken up recently it was found, says the *Public Ledger*, in such good condition as to warrant the continuation of it in the same service for another year.

Tests for Purity of Water.

In copying our reply to a correspondent in a recent issue of the SCIENTIFIC AMERICAN for a simple test for indicating the purity of water, the *Plumber and Sanitary Engineer* adds: "Tannin precipitates albuminoids from drinking water, but it also affects other matters which may be present in wholesome waters. The smell and color of a water constitute the most satisfactory of the ready tests of quality. To detect organic matter by the odor, the water should be warmed to blood heat in a large bottle half filled and corked. It should then be shaken, and if organic matter is present it may be detected in the air with which the water has been thus washed. The color is best seen by looking down at a white reflector through a column of the water contained in a long glass cylinder. A column of pure water should be at hand for comparison. Organic impurity gives shades varying from yellow to brown."

The London *Lancet* also has an article on the "Microscopic Examination of Water," in which the writer claims that the microscope, as at present used, reveals only the coarser forms of animal life, and those only with uncertainty, and that the discovery of the microscopic organisms has hitherto been very much a matter of chance. Patience and skill are even of slight help. Fortunately, however, certain chemical reagents kill these organisms without changing their appearance; osmic acid is of especial value for this purpose.

In the examination of water M. Certes employs a one and a half per cent solution of osmic acid. One cubic centimeter of this solution will suffice for thirty or forty cubic centimeters of water, all animal and vegetable organisms being by it rapidly killed and fixed. In a few minutes, in

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order to lessen the blackening action of the osmic acid, as much pure water as the test tube will hold is added. In certain waters rich in organisms the microscopical examination may be made in a few hours. If the water is comparatively pure, twenty-four or forty-eight hours must be allowed to pass. The liquid, with the exception of the last one or two centimeters, may then be decanted. The detection of the organisms in the residue is facilitated hy the employment of coloring agents, such as Ranvier's picrocarminate, methyl violet, logwood, etc. It is always well to introduce the coloring agent mixed with glycerine; the organisms are thus better tinted, and can, if desired, be better preserved.

The Conversion of Starch into Sugar.

In the new era which is before the brewing trade of this country there will be many problems to solve, and many opportunities to practically apply the teachings of science. The principal change which takes place in the brewer's mash tun is the conversion of an insoluble substance, starch, into soluble substances, dextrine, maltose, and dextrose; the exact nature and proportion of these resulting saccharine bodies are not yet absolutely determined, and they vary considerably with changes of temperature, time, and quantities. The brewer's art consists largely in the production of a wort of suitable composition, by which we mean, one containing all the essential constituents for a healthy fermentation, and also a due proportion of such substances as will resist the disintegrating properties of yeast, and remain to fulfill their proper functions in the finished beer.

Hitherto the only converting agent at the disposal of the brewer has been the diastase of the malt, and in the future, in all probability, this will also be the principal converting agent, even if raw grain be used in conjunction with malt. But with a free mash tun, we shall be at liberty to avail ourselves of other methods of conversion if there be such, and if they can be practically applied. It is now well known that dilute sulphuric acid exerts a solvent action on starch very similar to diastase: but while malt extract converts starch into dextrine, maltose, and dextrose in varying proportions, with probably other intermediate products, boiling dilute sulphuric acid converts starch almost immediately into the ultimate product—dextrose, accompanied by only small quantities of dextrine.

This property of sulphuric acid is largely made use of by the glucose manufacturers, and in this way the enormous quantities of this substance, both home made and imported, are prepared; the process consists in boiling maize or other grain containing a large proportion of starch, with dilute sulphuric acid, sometimes under pressure, although this is not absolutely necessary, except for hastening the change, and after neutralizing the acid with carbonate of lime the saccharine liquid is concentrated to a sirup, which solidifies on cooling. A large amount of fuel is employed in evaporating the sirup, and as the solid glucose has to be dissolved again by the brewer, this represents a considerable loss. With perfect freedom in the choice and manipulation of his materials, it is more than probable that the brewer will learn to use sulphuric acid as a converting agent; but besides the conversion of starch into dextrose, sulphuric acid will be useful in inverting cane sugar.

The plant required for carrying on this conversion of starch into sugar by means of sulphuric acid is very simple, for pressure is only required when a complete conversion into dextrose or glucose is desired; but the brewer prefers to have a mixture of dextrine and intermediate products with his dextrose, and he would, therefore, probably obtain the most satisfactory result by conducting the operation at the ordinary pressure.

Distillers who now use large quantities of raw grain in their mashing process have already in some instances availed themselves of this property of sulphuric acid, and lead-lined mash tuns for the purpose are not unknown; brewers may in the future find it worth their while to do the same, and in answer to the objection by so doing they will be converting their breweries into chemical manufactories, we say the process of mashing is essentially a chemical operation, and that as the products obtained by the judicious use of sulphuric acid and malt extract are really identical, there can be no valid reason for not using the first-named agent, if it possesses any advantages over the latter. —*Brewer's Guardian.*

Learning Versus Common Sense.

Democritus long ago drew an emphatic distinction between learning and wisdom. Learning consists of knowledge acquired mainly from books, and often its possessor is developed by its acquisition only in his perceptive and retentive faculties. Though his memory may be a vast storehouse of useful facts and brilliant second-hand ideas, yet, owing to a judgment originally weak and only partially trained to discriminate, he may be the most inconsequent and uncertain of reasoners. Wisdom, on the contrary, is the outgrowth of native sagacity, sound judgment, wary discretion—in a word of good common sense, and yet of common sense acting under the enlightenment of more or less knowledge. Thus wisdom makes a man a true seer. He not only sees and grasps the best means to accomplish an end, but he instantly sees and selects the highest and best ends as the objects of his aim and life. Regarding learning and knowledge as the same thing, we may conclude with Cowper that

> Knowledge and wisdom, far from being one,
> Have ofttimes no connection.

The paradox is, therefore, not unfrequently met of learned physicians who are destitute of skill as practitioners, of learned orators who are wretched statesmen, of learned linguists who are little better than fools, and finally of learned theologians who are the worst possible interpreters of the oracles of God.—*Christian at Work.*

THE WILLIAMSPORT PANEL PLANER.

The panel planer shown in the annexed engraving is manufactured by Messrs. Rowley & Hermance, of Williamsport, Pa., and possesses several features which render it very efficient. It is designed for planing door panel and cigar box stuff, and is especially adapted for general use in manufacturing furniture, doors, and boxes, and may be used to advantage in any wood-working shop.

The frame is cast in a single piece, giving it great rigidity, and its form being pyramidal gives it a very wide base, which insures stability. The machine is provided with two pressure bars, one on each side of the head; the front one being hinged and weighted adjusts itself automatically to different thicknesses of stuff. Both of these bars are placed very near the head to prevent the work from clipping or tearing out.

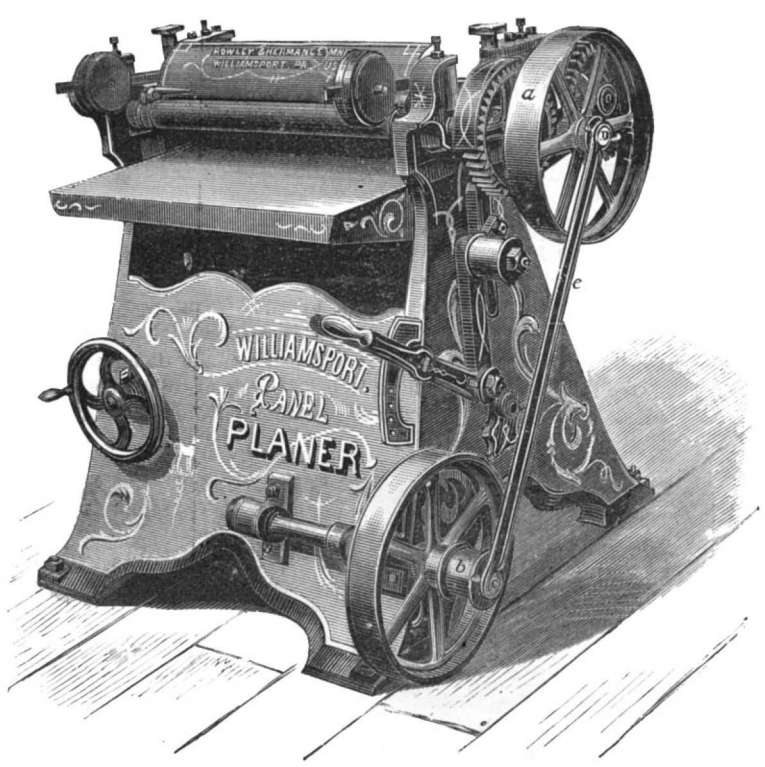
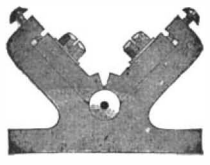


Fig. 1.—THE WILLIAMSPORT PANEL PLANER.

The cutter head is of forged steel, and being of small diameter may be run at a high rate of speed with perfect safety. This is very important, especially in working brash and cross-grained lumber. This machine is provided with two devices for preventing the marring of the surface of the lumber as it is delivered from the machine, one being a steel scraper attached to the delivering roll for preventing it from gumming and marking the lumber; the other is a shaving guard, which is so arranged as to prevent the shavings from getting under the smooth rolls and imprinting the work. This is a very essential feature in a smoothing planer. The feed is very powerful, the machine having two geared feed rolls. The planer is capable of planing long or short stuff with equal facility. Stuff as short as four inches, and from one-sixteenth to six inches thick, may be planed without clipping the ends. The machine is made in two sizes, adapted to lumber eighteen or twenty-four inches in width. The smaller machine weighs about 1,200 pounds, the larger one 1,400 pounds, and the speed of the head is from 4,000 to 5,000 revolutions per minute. It will be noticed that the planer is very heavy; it is strong, well built, and calculated to withstand constant use.



(Patented May 9, 1871, and September 23, 1879.)

Fig. 2.—Ellis's Adjustable Journal Box.

The journals of the head are provided with Ellis' journal box, the patents for which have been acquired by this firm at considerable expense and trouble. This box, which is shown in detail in Fig. 2, is entirely different from the ordinary cap box, and will keep the shaft central and tight until the box is worn out, and heating and trembling of the shaft, and the trouble of taking out liners, scraping, and readjusting, are avoided.

The construction of the box will be readily understood by referring to the engraving. It is made in three parts, the caps being held in place by bolts and adjusting screws, and they are tightened by loosening the bolts and setting down the adjusting screws at the ends of the caps, an operation requiring less than a quarter of the time required to adjust a box of the old style.

The advantages of a box of this description will be apparent to practical men, and there can be no question but that, other things being equal, a machine having journal boxes of this kind is to be preferred to one having the ordinary boxes.

MISCELLANEOUS INVENTIONS.

Mr. Aden K. Munson, of Marysville, Kan., has patented a yoke to be used with a pair of horses in driving a plow, whereby the horse in the furrow may at all times control the tongue and guide the plow, while the horse on the land can pass around any obstruction and come in place again without changing the direction of the plow.

A machine for forming flanges on counter-stiffeners for boots and shoes has been patented by Mr. Hiram G. Farr, of Brandon, Vt. The invention consists in a novel arrangement of a concave mould and convex mould for pressing the material into the required shape.

An improved baling press has been patented by Mr. John H. Simonson, of East Norwich, N. Y. It consists in the combination with the followers, of a series of levers, bars, and ropes, so arranged that the followers may be drawn toward each other with constantly increasing power.

An improved limekiln has been patented by Mr. William Hughes, of Avondale, and Joseph L. Foulk, of Strasburg, Pa. This invention relates to that class of kilns known as "continuous" kilns, or those in which the limestone is supplied to the top of the stack, and as it settles during the calcining process the lime is drawn off at the bottom of the heating chamber, and a fresh supply of limestone is added to the top of the unconsumed mass in the heating chamber or stack; and it consists, first, in an improved construction of combustion chamber, in combination with a peculiar arrangement of furnaces to direct the flame equally across the entire area of the combustion chamber to prevent the formation of cores or unburned masses of limestone, in connection with a relative arrangement of draw chute or delivery channel which will secure an economy of space together with the greatest effective volume of flame or caloric from the furnaces.

Mr. Christopher G. Calo, of Albany, N. Y., has patented a simple device for instantaneously fastening and unfastening hames. In consists in a combination of devices which cannot be clearly described without an engraving.

Mr. Josephus H. Rosson, of Columbus, Ky. has patented an improved holder for hair, bristles, broom straw, and like material, for making brushes or brooms in a simple and convenient manner.

Mr. John D. Baxter, of Mechanicsville, N. Y., has patented a double-edged chisel provided on each side with a groove, which extends from between the points upward to the shank of the chisel, said grooves widening as they extend upward, the object being to render the chisel self-clearing.

An improved wagon spring, patented by Mr. William G. Hughes, of Churubusco, Ind., consists of a spiral spring set on the end of a wagon bolster and held in a vertical position in a framework of arched rods, while resting centrally on the top of the spring is a slotted yoke, from the ends of which depend two eyebolts or clips and links, that pass down to or through cross bars which extend laterally from beneath the wagon bed, and thereby support the wagon body.

An improved gate, so arranged that it can be conveniently opened and closed from a vehicle or by a pedestrian, has been patented by Mr. Edward Lanning, of Iowa City, Iowa. It consists in a balanced gate, pivoted near its center, and provided with two pulleys, to which ropes or wires pass, by means of which the latch and the gate are opened and closed. The gate has an improved head containing a weighted lever and pulleys for the purpose of keeping the latch in its proper place or for drawing it.

Mr. Charles L. Wolff, of Edgewater, N. Y., has patented an apparatus for supporting the middle part or center of the top or arch of cisterns and other structures while being built, so constructed that it can be readily taken out through the man-hole when the work has set, and which will allow the floor and sides of the cistern to be cemented before the middle part of the top is built.

Mr. Frederik Alsing, of Copenhagen, Denmark, has patented a compass provided with mechanism so constructed as to record all changes of direction in the ship's course and divide the diagram of the course into hour spaces.

An improved compensating pendulum, patented by Mr. Charles T. Mason, of Sumter, S. C., consists in a compound bar of metal bent in curved form, hung on the pendulum rod, and connected by links with the sliding bob in such manner that the expansion and contraction of the compound bar shifts the bob in the direction of the length of the pendulum. The bob is sustained by the compound bar, and the latter hung on the pendulum rods by a screw rod, which permits adjustment for regulating the clock.

An improved grain toller has been patented by Mr. William J. Wilson, of Stephenville, Texas. This invention consists in a novel construction of a revolving cylinder provided with cavities representing certain measures, and of a casing in which the cylinder works, whereby provision is

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made for measuring the grain by the revolution of the cylinder, and at the same time separating a certain proportion thereof to be retained as toll, and whereby, also, provision is made for varying the size of the toll measure, so as to enable it to separate different proportions from the main body of the grain, according to the amount of toll to be taken.

Mr. Charles S. Woodruff, of Troy, N. Y., has patented a toe weight for horses. The object of this invention is to provide, in addition to the ordinary strap by which toe weights are usually secured to the feet of trotting and road horses, a fastening device by which the weight is firmly secured in position.

An improved steam radiator has been patented by Messrs. Lewis G. Goldsmith and Nicholas Reed, of Jersey City, N. J. The object of this invention is to furnish steam radiators, constructed so as to have a much larger radiating surface than those constructed in the ordinary manner, and at the same time to induce a free circulation of air between and around their parts.

A clearing device for millstones, patented by William H. Hall, of DeWitt, Iowa, is designed to prevent the collection of the chop between the stones and the curb, and thus prevent the consequent glazing of the stones, rendering it unnecessary to dress the stones so frequently, and causing the stones to run with less resistance, consequently requiring less power to drive them.

Mr. August Hilpert, of Hoboken, N. J., has patented an improved method of inlaying sheets of card or leather board or like material, so as to produce novel and effective ornamental sheets, which may be used for various purposes. The invention consists in punching the desired design out of a sheet of card or leather board, thick paper, or like fibrous material, and filling in the apertures thus produced with corresponding pieces of the same or some other suitable material pressed into the apertures.

Mr. Jerome W. Dewey, of Chicago, Ill., has patented an ironing board formed of two parts, held together by dowel-pins, and is provided with a beveled rabbet along the edges, into which a metal frame for holding the goods to be ironed fits. This frame is drawn up tight by means of a cam lever, a spring, and screw.

Messrs. Jules A. Arrault, of New York city, and Jules Schmerber and Charles Schmerber, of Paterson, N. J., have patented a process for manufacturing nitro-derivatives from cellulose, etc., by using nitric acid in a gaseous state. By this process but little more acid is used than the theoretical quantity required to transform the substances into their nitro-derivatives.

Mr. John F. McLaughlin, of Aiken, S. C., has patented an improved bale tie, which is simple, strong, and reliable, and which is so constructed that the bands may be taken off without cutting or breaking them.

An improvement in pantaloon braces has been patented by Mr. Charles Laffite, of Paris, France. The invention consists in providing the suspender ends with short transverse straps or chains.

Mr. Henry G. Bardwell, of Winnton, Texas, has patented a buckle of novel design, especially adapted to bridles, check-lines, and hip straps for horses, and for trunk straps, gun straps, etc.

Mr. Louis J. Ryerson, of Paterson, N. J., has patented an improved starching machine, which consists in a pair of corrugated rubbers having a parallel reciprocating motion imparted thereto by eccentrics or a double crank, one of which rubbers is arranged to slide in a direction at right angles to the direction of the reciprocating movement of the rubbers, and is attached to one end of a bell crank lever pivoted to the frame of the machine and provided with an adjustable weight for the purpose of pressing the two rubbers together. A fixed and a hinged arm, provided with a suitable lock, are arranged above the rubbers for the purpose of holding the goods or articles to be starched.

Mr. Herman E. Briggs, of Center Star, Ala., has patented a simple device by which stock may be tethered and have free movement for grazing without becoming entangled in the rope.

An improved furrow-staff for millstones has been patented by Mr. Ura H. Palmer, of Green Spring, O. The object of this invention is to furnish a furrow-staff so constructed that by its use the furrows of a millstone-dress may be brought to a perfect gauge.

Mr. John Y. Lanfair, of Hill View, N. Y., has patented an improvement in that class of churns in which a suspended dasher is made to swing back and forth in the body of the churn; and it consists of a dasher composed of a number of downward projecting rigid fingers that are made to swing back and forth between a number of corresponding fingers that are fixed so as to project upward from the bottom of the churn.

Mr. John S. Butcher, of Yorktown, N. J., has patented an improved protector for lamp chimneys, which prevents breaking by the heat of the burner. It consists in a protector for lamp chimneys formed of two tapering metal tubes, one of which has a greater taper, and is suspended from the lower edge of the other, which in turn is suspended from a looped wire resting on the upper edge of the lamp chimney.

An improvement in tongs has been patented by Mr. Irving R. Le R. Boardman, of Snedekerville, Pa. The invention consists in a novel construction of the head of the tongs and arrangement of the legs therein, whereby provision is made for insuring the proper motion of the movable leg and preventing its lateral displacement.

Mr. John B. Stewart, of St. Johns, Mich., has patented an effective, cheap, and simple device for fastening buttons on clothes, and it may be used as a belt fastener, and for kindred purposes.

Mr. William H. Miller, of Philadelphia, Pa., has patented an improved mosquito netting device, by means of which mosquito netting can be put up or taken down easily.

A pigeon hole bottom for post office boxes, secretaries, and desks, consisting of a perforated plate bent down at the ends and having the edges lapped to form receptacles, has been patented by Mr. James E. McNair, of Webb City, Mo.

An improved gate has been patented by Mr. James H. Greenhow, of Eckmansville, Ohio. This invention consists in novel details of construction of the gate and means for opening and closing it.

The Cause of Perpetual Snow.

Dr. James Croll, in the current number of the *American Journal of Science and Arts*, says the reason why snow at great elevations does not melt, but remains permanent, is owing to the fact that the heat received from the sun is thrown off into stellar space so rapidly by radiation and reflection that the sun fails to raise the temperature of the snow to the melting point; the snow evaporates, but it does not melt. The summits of the Himalayas, for example, must receive more than ten times the amount of heat necessary to melt all the snow that falls on them, yet in spite of this the snow is not melted. Notwithstanding the strength of the sun and the dryness of the air at these altitudes, evaporation is insufficient to melt the snow. At low elevations, where the snowfall is probably greater, and the amount of heat received even less, the snow melts and disappears. This, Dr. Croll believes, must be attributed to the influence of aqueous vapor. At high elevations the air is dry and allows the heat radiated from the snow to pass into space, but at low elevations a very considerable amount of the heat radiated from the snow is absorbed by the aqueous vapor in the atmosphere. A considerable portion of the heat thus absorbed is radiated back on the snow, and, being of the same quality as that which the snow itself radiates, is for that reason absorbed by the latter. The consequence is that the heat thus absorbed accumulates in the snow till this is melted. Were the amount of aqueous vapor possessed by the atmosphere sufficiently diminished, perpetual snow would cover our globe down to the sea shore. In a like manner the dryness of the air will, in a great measure, account for the present accumulation of snow and ice on Greenland and on the Antarctic Continent. These regions are completely covered with snow and ice, not because the quantity of snow falling on them is great, but because the quantity melted is small. And the reason why the snow does not melt is not because the amount of heat received during the year is not equal to the work of melting the ice, but mainly because of the dryness of the air, the snow is prevented from rising to the melting point. In places like Fuego and South Georgia, where the snowfall is considerable, perennial snow and ice are produced by diametrically opposite means, namely, by the sun's heat being cut off by clouds and dense fogs. In the first place, the upper surfaces of the clouds act as reflectors, throwing back the sun's rays into stellar space, and in the second place, of the heat which the clouds and fogs absorb, more than one-half is not radiated downward on the snow, but upward into space. And the comparatively small portion of heat which manages to reach the ground and be available in melting the snow is insufficient to clear off the winter's accumulation.

Ballooning.

At a recent meeting of the Balloon Society of Great Britain, held in London, Mr. Simmonds reported some incidents of an ascent he had made at Bath a short time previous, under the auspices of the society. On this occasion the balloon entered altitudes varying from 4,000 feet to 12,000 feet, and traversed a distance in one direction of 16 miles in the same number of minutes. Allowing for the fact that the ascent and descent were both accomplished in a perfect calm, it follows that the balloon in certain stages of its career must have been impelled at a speed of not less than 120 miles an hour—a very remarkable result. A somewhat animated discussion which followed, as to the best system of ballooning in the Arctic regions, was adjourned to the next meeting. The president stated that the present system of inflating balloons was very defective. Instead of employing coal gas different kinds should be used together, namely, coal gas, oil gas, and hydrogen, the former for partial inflating, the second for making the balloon gas tight, and the third for reducing the weight of the two former. He considered that the only means of determining the law of currents at high altitudes, as shown by the before mentioned trip of Mr. Simmonds, at Bath, was by means of balloons.

The Bagdad Date Mark.

Bagdad, says one of our medical exchanges, is noted for a curious and mysterious malady, which affects everybody in the city, whether he be citizen or stranger. It is a sore called a "date mark," because after it has healed it leaves an indelible mark about the size and shape of a date. It generally makes its appearance upon the face, lasts a year, and then disappears. The cheek of nearly every man and woman in Bagdad shows the inevitable mark. Sometimes it settles upon the nose, and then the disfigurement is great; sometimes on the eyelid, when blindness is the result. Strangers are attacked even after a brief residence; but fortunately, if they are adults, the sore is more apt to come on the arm. In every case the attack runs its course for one year. No treatment, no ointment, nor medicine, it is said, has the slightest effect upon it. Once the sore appearing, the sufferer knows what to expect, and may as well resign himself to his fate. The Arabs say that every one who goes to Bagdad must get the "date mark"; or, if he does not get it while in the city, he will be followed by it—have it sooner or later he must. Dr. Thom, of the American Mission, states that he has examined the ulcer microscopically and found it to be composed of a fungoid growth; but nothing that he had ever tried had proved remedial.

AGRICULTURAL INVENTIONS.

Some improvements in corn planters have been patented by Mr. Charles G. Everet, of Bellefontaine, O. These improvements pertain to the construction and arrangement of devices forming the seed discharging mechanism proper and the devices for imparting regular or uniform motion to such mechanism; also to the devices for indicating the intermittent operation of the seed dropping slides.

An improved fertilizer attachment for seed drills has been patented by Mr. Adam C. Hendricks, of Duffield Station, W. Va. This improvement relates to the construction of a hand lever and the attachment of it and the gates for controlling the discharge of seed to a shaft which is arranged parallel to the side of the hopper.

Mr. William E. Hart, of Cedar City, Mo., has patented an improved harvester, which gathers the cut grain as it is deposited upon the binding platform into gavels and drop the gavels to the ground at the rear of the machine automatically.

An improved reaping and mowing machine has been patented by Mr. David Forrest, of Eastport, Me. The object of this invention is to obtain a smooth and continuous cutting action by revolving knives, and to construct a machine requiring comparatively small power for its operation.

Mr. William A. Reddick, of Niles, Mich., has patented a shovel. This invention relates to an improvement in shovels of that class which are formed of parallel open tines, for use in culling potatoes from the loose earth, screening coal, sifting ashes, and for other analogous purposes.

An improved sulky plow has been patented by Mr. Louis W. Powell, of Mexia, Texas. This invention consists in a novel construction and arrangement of hangers, braces, and levers, whereby provision is made for the attachment of plow beams of different sizes, and for adjusting the parts.

An improved grain binder has been patented by Messrs. Ransom K. Laraway and Jerome Laraway, of Battle Creek, Mich. This invention relates particularly to that class of grain binders which bind the gavel with a string or twine by tying a knot in it, although it is capable of doing the same work with fine wire.

The Light of Jupiter.

There has been for some years a discussion as to whether the planet Jupiter shines to any perceptible extent by his own intrinsic light, or whether the illumination is altogether derived from the sun. Some facts ascertained from spectroscopic observation by Prof. Henry Draper, and communicated by him to the current number of the *American Journal of Science and Arts*, seem to point to the conclusion that it is not improbable that Jupiter is still hot enough to give out light, though perhaps only in a periodic or eruptive manner. Most of the photographs hitherto made of the spectrum of Jupiter by Prof. Draper, bear so close a resemblance to those of the sun as to indicate that under the ordinary circumstances of observation, almost all the light coming to the earth from Jupiter must be merely reflected light originating in the sun. But on one occasion—September 27, 1879—a spectrum of Jupiter with a comparison spectrum of the moon was obtained by him which showed a different state of things. The photograph which was taken of this shows, not a change in the number or arrangement of the Fraunhofer lines, but a variation in the strength of the background. These modifications in the intensity of the background seem to Prof. Draper to point out two things that are occurring: (1.) An absorption of solar light in the equatorial regions of the planet. (2.) A production of intrinsic light at the same place. These two apparently opposing statements can be reconciled on the hypothesis that the temperature of the incandescent substances producing light at the equatorial regions of Jupiter did not suffice for the emission of the more refrangible rays, and that there were present materials which absorbed those rays from the sunlight falling on the planet. The strengthening of the spectrum in the portions answering to the vicinity of the equatorial regions of Jupiter, says Prof. Draper, bears so directly on the problem of the physical condition of the planet as to incandescence that its importance cannot be overrated.

A Village Founded on Gold Rock.

The village of Las Placitas, about thirty miles from Santa Fé, New Mexico, is reported to be founded on a ledge of rock carrying from $3,000 to $6,000 worth of gold per ton. The value of the rock was detected by prospector Jesse Martin, who has "located" the streets of the town. Governor Lew Wallace describes the lead as eighty-four paces in width, and nine thousand feet have been located along the vein. The whole village is built on the ledge, and rock worth $3 a pound has been thrown about as worthless.

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NOVEL AIR BRAKE.

It is well known among engineers and engine drivers that in reversing the valves of a locomotive in the usual way to check the speed of the engine the pistons draw in air and compress it in the steam chest and steam supply pipes, until, in some instances, the pressure is greater than the steam pressure in the boiler. Our engraving represents an invention for utilizing this action of the locomotive cylinders for the purpose of operating air brakes for checking or stopping the train, and it also avoids drawing cinders into the cylinders, a thing common to engines working in the ordinary way.

The engraving represents only such parts of the locomotive as are immediately related to the invention, Fig. 1 being a view of the front end of the smoke box with the cylinders left out; Fig. 2 a side view of the same parts; Fig. 3 a sectional view of the exhaust nozzle, and Fig. 4 is a detail view of the safety valve lever.

A and B are, respectively, the exhaust and supply pipes, connected with the cylinders in the usual way, and C is an exhaust nozzle of the ordinary pattern, except that it is provided with a sliding valve or cover, D, and a pipe or nozzle, E, which projects through the cap of the smoke box, and is provided with a flaring mouth. The pipe, E, is provided with a plug valve or cock whose spindle extends through the side of the smoke box and is provided with an arm connected with a rod extending to the cab of the locomotive; on the inner end of the same spindle there is an arm connected by a link with the valve, D, the cock and the valve, D, being arranged relatively to each other so that when the valve, D, is open the cock will be closed, and *vice versa*.

From the top of the steam pipe, B, a pipe extends upward through the top of the smoke box, and has at the top a safety valve, F, of ordinary construction, whose lever extends over the smoke box and is held down by a spring connected with a lever fulcrumed on the top of the boiler, and moved so as to bring more or less pressure on the valve by turning the cam on the shaft, G, by means of the lever attached. This lever is provided with a pawl arranged to engage the teeth of a fixed segment.

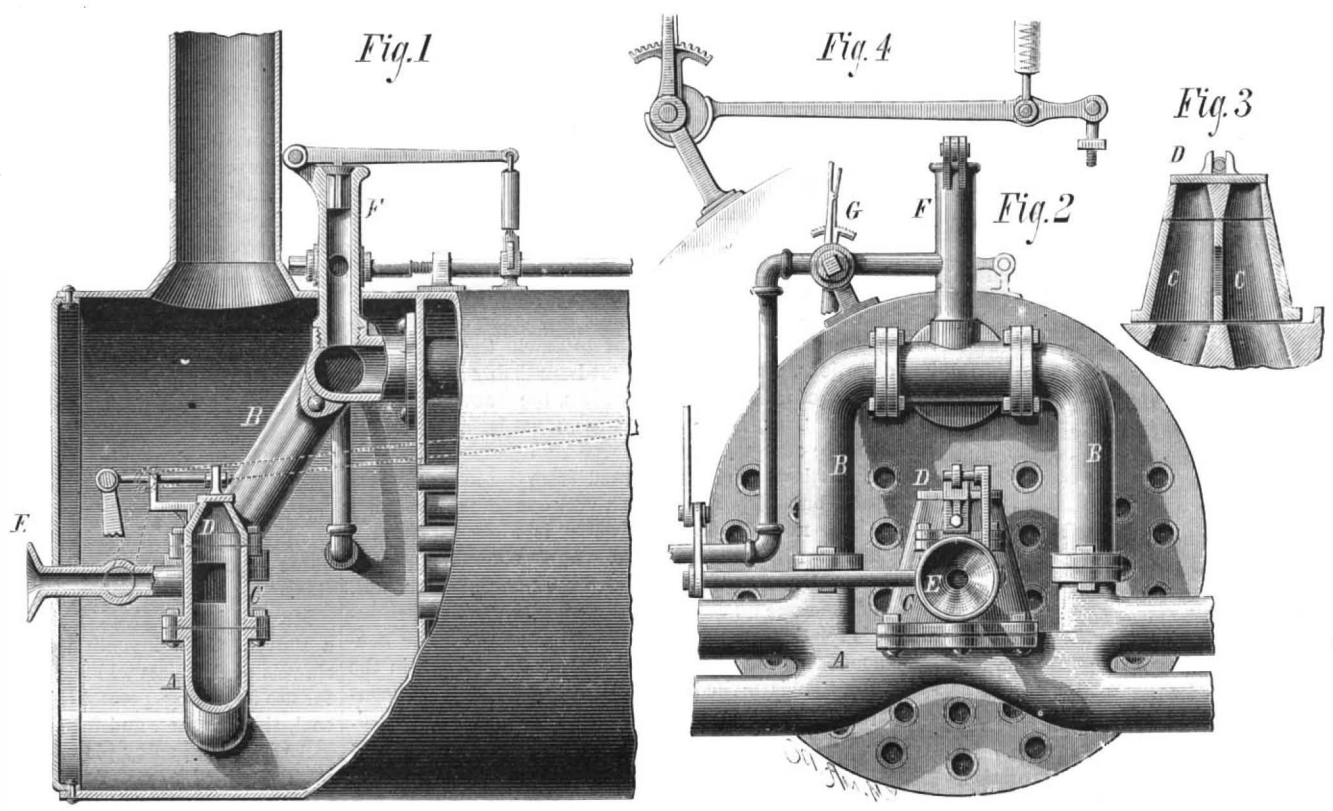
Below the valve, F, a pipe extends a short distance laterally from the vertical pipe, and then passes downward and is connected with the pipe or pipes leading to pneumatic brake cylinders of any approved form. This pipe is provided with a three-way cock, whose spindle extends through the shaft, G, which is tubular and reaches to the cab, where it may be conveniently operated.

On shutting off the steam from the cylinders and reversing the valves, the valve, D, is closed and the valve in the pipe, E, is opened; the cylinders then act as powerful pumps drawing in air through the pipe, E, and forcing it into the steam chest and steam pipe, B. The required pressure is quickly reached, and the surplus air escapes through the valve, F. Should this operation fail to check the engine sufficiently the three-way cock in the air discharge pipe is opened and air is allowed to escape from the steam supply pipe, B, to the pipes leading to the brake cylinders. An abundant supply of compressed air is always ready, and more or less of it may be used in operating the brakes.

When it is desired to let off the brakes the three-way cock is turned so as to shut off the air supply and liberate the air contained in the brake cylinders and pipes connected with them. The inventor proposes also to connect the three-way cock with an air reservoir so that a quantity of air may be stored if desired. After letting the air out of the brake cylinders, the valve, D, is opened, and the valve in the pipe, F, is opened when the engine is in its normal condition.

Another feature of the invention, and a very important one, is that engines commonly used for drawing freight trains can be utilized to stop this class of train without the brakemen getting upon the top of the cars, and it enables railway companies to place such engines on passenger trains and have the advantage of the air appliances on the cars as described.

This invention dispenses with all special pumps and utilizes the momentum of the moving train for braking purposes. To any one doubting the ability of the engine cylinders to act as air compressors we mention the fact that an engine has been made to compress sufficient air in its boiler, while being drawn forward by another engine, to propel itself forward at the usual rate of speed for several miles by compressed air alone, there being neither fire nor water in the boiler. This invention was recently patented by Mr. John Hall, of Hamilton, Ontario, Canada.



HALL'S AIR BRAKE.

NEW LINE-THROWING GUN.

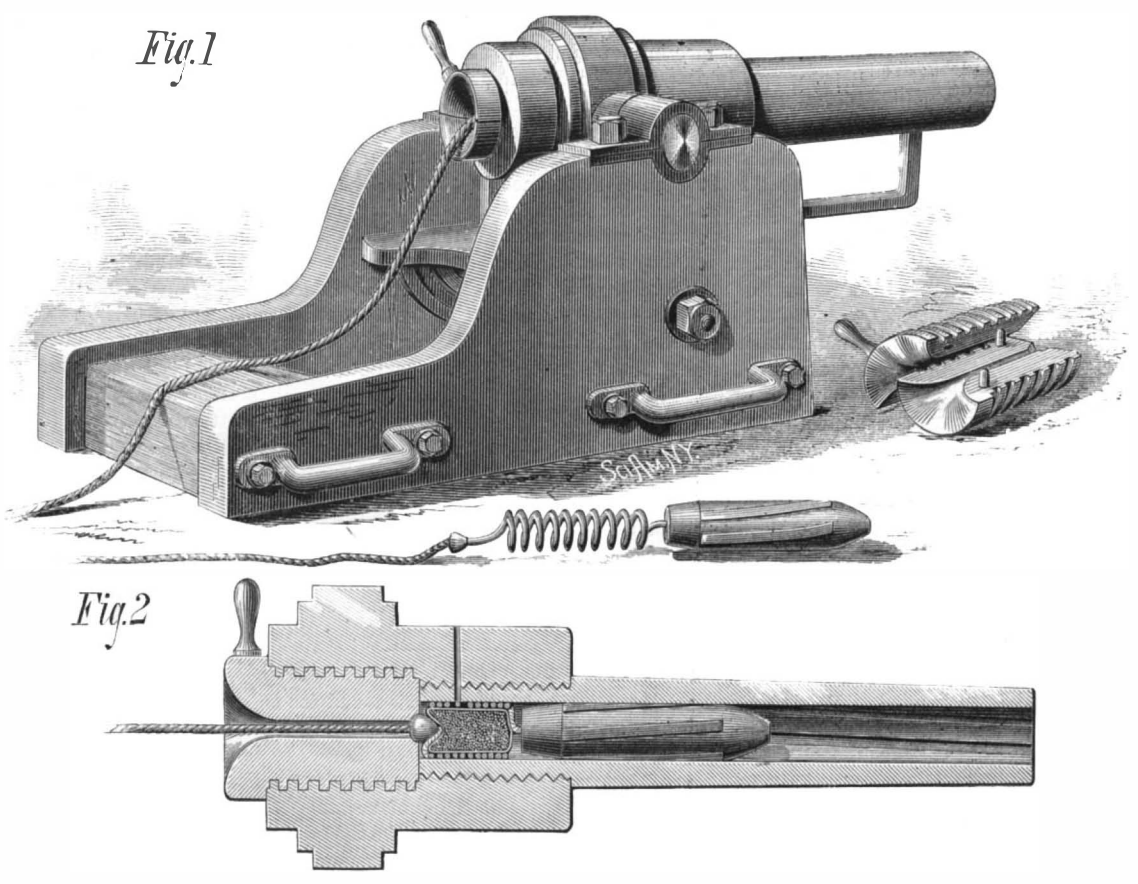
The engraving shows a breech-loading line-throwing gun lately patented by Mr. L. W. Spencer, of this city. In some respects this gun differs materially from others designed for the same purpose. It is rifled to insure accuracy and to increase the range. It is breech-loading, and the projectile carries the line through the center of the breech.

Fig. 1 shows the gun in perspective, a detail view of the split breech piece being shown on the ground under the muzzle of the gun. Fig. 2 is a longitudinal section of the gun, showing the position of the line and load, and the projectile is shown at the side of the gun

The gun is mounted on the carriage by means of trunnions in the usual way, and is secured in any desired position by the clamping screws at the sides of the carriage. The breech block is made in two parts, with a central longitudinal opening for the line, and it has a heavy screw thread which fits the threads in the chamber in the breech of the gun. The projectile has attached to it a tail piece of wire rope or other material that will resist the action of the exploding charge which is enveloped by it. The tail piece is attached to the life line, and carries a valve which closes the opening in the breech block through which the line passes and prevents the backward escape of gas.

When the gun is fired the shot passes straight out of the gun, the elastic tail uncoils, and the life line is drawn through the opening in the breech block, in a direct line, so that it does not in any way interfere with the course of the projectile.

With this gun the projectile is thrown out with no retardation except that caused by the weight of the life line. By the ordinary method, when the life line is fired out of the gun ahead of the projectile, the weight of the line compels the projectile to turn over, greatly retarding the speed of the projectile and line and affecting the accuracy of firing.



SPENCER'S LINE-THROWING GUN.

MECHANICAL INVENTIONS.

An improved wagon brake lever has been patented by Mr. Edward S. Plimpton, of Denison, Iowa. This invention consists in a novel arrangement of a double jointed lever, with a pawl and ratchet and a rod connecting with the brake shoe, whereby provision is made for locking the brake by the engagement of the pawl with the ratchet, and for disengaging the pawl to release the brake.

Mr. Israel Erickson, of Whitehall, Mich., has patented a simple and effective device for feeding sawdust, shavings, etc., to a fire and spreading them thereon. The invention consists of spreading bars or spreaders, having outwardly curved rear ends, and pivoted at about the center of their lengths to the under side of a reciprocating plate or frame supported on rollers, and works in a spout or conductor fixed in front of a fire door, the spreaders being opened or spread laterally by contact of their curved ends with fixed rollers, and being closed by a connecting spring.

An improvement in car couplings, invented by Mr. Philo B. Williams, of Edgerton, Ohio, relates to that class of couplers with which cars can be coupled without the brakeman going between the cars for that purpose; and it consists of a spear or dia-

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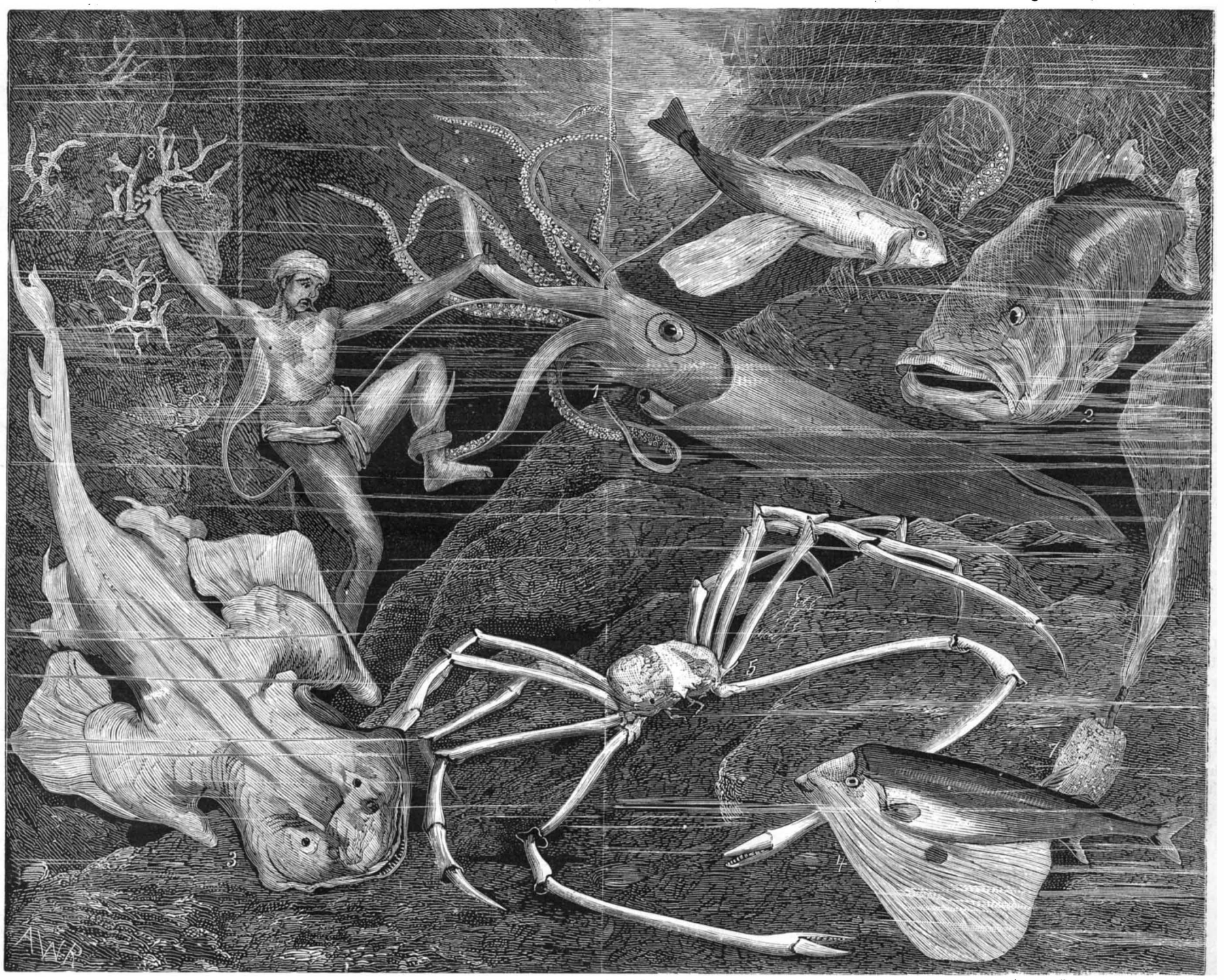
mond-shaped pointed coupling bar, and of a draw head provided with an internal shoulder and a swinging metallic plate, which engage and hold the point of the coupling bar.

THE JAPANESE AND CHINESE SECTIONS OF THE BERLIN INTERNATIONAL FISHERIES EXHIBITION.

BY A. W. ROBERTS.

The fishes and marine animals in the Japanese and Chinese sections of the Berlin International Fisheries Exhibition were objects of the greatest interest. These specimens of the marine life of Eastern Asia were prepared by native taxidermists, and to obtain a more artistic and picturesque effect they were grouped (by Mr. K. Slemenroth) to represent Japanese and Chinese marine life.

No. 1 represents the polypus, or devil fish (*Megateuthus martensii*), the body measuring thirteen feet in length, the head being provided with eight arms, each being fourteen feet long, the ends of which are provided with powerful suckers.



MARINE ANIMALS OF THE JAPANESE AND CHINESE SECTIONS OF THE BERLIN INTERNATIONAL FISHERIES EXHIBITION.

1. Polypus. 2. Giant Perch. 3. Angel Fish. 4. Fan Fish. 5. Giant Crab. 6. Flying Fish. 7. Glass Sponge. 8. Coral.

The devil fish fisheries of Eastern Asia are of great importance, as the following figures will show: In 1873, 9,000 boats were engaged in capturing devil fish, each boat being manned by six fishers, the annual yield being over 14,520,080 pounds, valued at $375,000; 80,000 persons were also engaged in preparing and packing the flesh.

Through the establishment of public aquaria more correct information of the habits of these (the smaller varieties) wonderful fishes has been obtained.

We call them fishes, but they bear no resemblance to fish that have scales and swim by means of their fins and tail. Scientifically they are not fishes at all, but are very closely related to our oysters, clams, and other mollusks. Scientists classify the devil fish or octopus (meaning eight-armed) as belonging to the division of soft-bodied mollusca and of the class *Cephalopoda*, meaning feet projecting from the head.

They breathe by taking in water at the broad and open end of their bag-like body through two large gills, and ejecting it through a short and thick tube or funnel situated below the head in front. By this means they propel themselves backwards through the water.

One of the most curious features about a devil fish is that he has several hundreds of sharp and serrated sucking disks distributed in two rows along each arm. Each disk is a short thick cylinder, the center of which can be raised so as to establish a vacuum between itself and the object to which it is attached. As the weight of a man in water is about five pounds, it would not be difficult for a medium sized devil fish to drag him under water. The food of the devil fish consists of crustaceans and bottom fishes.

In the illustration the devil fish is shown in the act of entangling a coral diver in his terrible embrace.

No. 2 is an example of Japanese perch, being only six feet in length, and is the largest known variety of the perch tribe.

At No. 3 we have the old-fashioned angel fish (not the exquisite angel fish (*Chætodon*) of the tropics). It got its name of angel fish from its supposed resemblance to a cherub, such as are to be seen at the present day on ancient headstones in Trinity churchyard. It is also known by the name of monk fish, exactly why I don't know, as it has anything but a holy look when fresh from the ocean. The most proper name it has received is the shark-ray, as it looks like an exact connecting link between the shark and ray or skate tribes. It is a bottom fish and feeder, living on crustaceans, and is particularly partial to all the flat fish family. Its flesh, unlike the skate, is coarse and fibrous, and is seldom eaten, except by the very poorest classes. The only useful part of this fish is its skin, which, when dried, is used in place of sandpaper on woodwork, also for handles for swords, knives, etc.

In New York city this fish has been the means on several occasions of supplying our traveling shows with that class of circus natural history in the way of a mer-MAN. This wonderful production was the result of the artistic mind and delicate manipulation of a New York taxidermist (I use the term advisedly—stuffer would be better). I have seen white whales made out of sides of sole leather from the Swamp swim out of this same factory, and gorillas start up-town who, only a few days before, had been a living polar bear at Central Park.

Above the devil fish, at No. 6, is figured the flying fish (*Dactylopterus orientalis*). It derives its name from its ability to leave the water and skim over the surface, by means of its highly developed pectoral fins. It assumes this habit as a means of escape from its enemies.

No. 4 is the fan fish. Its beautiful pectoral fins are developed to an extent that enables it to rise out of the water and soar along its surface, after the manner of a bird.

I have had several living specimens of a variety closely resembling the one figured above, and known to fishermen as the flying sea robin. In coloring they were beyond describing, and for exquisite grace of motion were perfection itself. When resting on the bottom and with wings folded up close to their sides like a fan, they often gave forth a pleasant musical sound, from which is derived their tribe name, *volitans*. I lost several specimens of this gorgeous fish from their habit of leaving the aquarium at night, and their wings drying before they were able to return to the water. But one that I had kept for a long time had learned how to pass from one tank to another during the night, often making a run of six tanks. Their favorite food is the bait shrimp.

Some years ago great numbers of these fish, of a large size, visited our coast and were sold in the markets under the name "dolly vardens," on account of their brilliant colors.

The gigantic spider crab (Fig. 5), *Macrocheria*, or long-armed crab of Japan, is the largest crab known. In the cabinet at Rutgers College, N. J., is a specimen of this variety, which, when the claws are extended, measures eleven feet and six inches. There was at Barnum's (old museum) a specimen of this crab, presented by Mr. Carsom Brevoort, Esq., of Brooklyn, which measured twenty feet. This specimen was lost at the burning of the museum. The long-armed spider crab common on our coast is a close relation to this Japanese variety.

At No. 7 is shown the *Hyalenema*, or glass sponge, the skeleton or spicula of which is shown in the illustration as looking like a long bunch of slightly twisted fibers. This spicula is transparent and consists of pure silica. The wonderful Venus horn is a close relation to this Japanese variety. Under a microscope the spicula of various sponges present the appearance of stars, spades, hooks, spears, etc. There is a variety of sponge that grows on our oysters called oyster beard. This sponge is so full of fine spicula that the fishers' wives use it for scouring and polishing their cooking utensils.

No. 8 is the well known red coral of commerce. In Persia, China, and Japan this red coral (or the "daughter of the sea") used to bear the same value as gold. In Johnson's dictionary is the following definition: "Coral—a plant of as great hardness and stony nature while growing in the water as it is after long exposure to the air." Peyssonel was the first to make known its animal origin, but it was many years after that the scientists of Europe had to acknowledge that after all Peyssonel was right.

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PROVIDENCE RIVER OYSTERS.

The residents or visitors in Rhode Island and Massachusetts find these bivalves are highly valued. Ask, in hotels and saloons, for the finest oysters; the answer will be: "We have Providence Rivers."

"Little Rhody," though indeed small in area, has great industries. Providence, her largest city and capital, is the center of vast interests, of commerce, manufactures, education, etc. Her communications with Newport, Bristol, Fall River, Pawtucket, and other places, in or near the State, are so many and so direct, these seem but her suburbs. The largest solid silver manufactory in the world is to be found at Providence. The largest tool shop also, employing over fifteen hundred persons. About one hundred and fifty jewelry factories are located there. The famous Corliss Steam Engine Works also. Impressed, as even the casual observer will be, by the immense proportions that these and other businesses have attained there, he may overlook the one we seek to bring to notice. Yet it really holds no second place to any. Bays, rivers, estuaries, harbors, and lakes cover a large part of the surface of the whole State of Rhode Island. Providence River, Narragansett Bay, with the waters immediately around, contain large extents of natural oyster fields.

The possibilities of oyster production in these waters are beginning to be very much talked of. They are, as yet, however, but feebly realized. The advantages there over most other places of equal extent in our country are quickly seen. These waters are well sheltered from storms. They are nowhere very deep. There is much of what is called good bottom. And many fresh water streams are continually flowing in.

Many persons are now taking up the available ground for cultivation. Yet the State laws are not very encouraging to a rapid increase of the enterprise. One can lease but not own the ground. The annual rent is ten dollars an acre. The expense of surveys, committee, and records must be paid by the person securing the ground.

From its earliest history, laws have been made in Rhode Island to regulate fish and oyster industries. It is now plain that some additional legislation is needed, if the enterprise of producing good oysters is to be fostered much in that State.

Indians were very numerous and powerful there when white men came to settle. These tribes were drawn to the region because of the abundant supplies of sea food as well as game. Geographers have recently fixed upon Rhode Island as the ancient *Vinland* said to have been discovered by the Northmen in A. D. 1000. If reliance is to be placed on the "Icelandic sagas," a critical examination of them leads to this result. Verrazzano visited the Bay in 1524.

Rev. William Blackstone and his wife Sarah were the first actual settlers of this territory. They came from Boston in 1634. He had been the first white settler of Boston. Having left England to get away from "lord bishops," he went from Boston to be out of the power of "lord brethren." He made his home on the river Blackstone, six miles north of Providence. He named his place "Study Hill."

In 1636 Roger Williams, fleeing from persecutions suffered from Puritans for his religious views and courses, came to the east bank of the Seekonk River. There were with him John Smith, William Harris, Francis Wickes, and a lad named Thomas Angel. As their boat was coming to the shore an Indian from the hill greeted them with "What cheer, netop [friend]?" A tract of land near that place has ever since borne the name of "What Cheer."

This company soon moved to the western side of the river and began a settlement, which has now grown to a city of over one hundred thousand people. Williams named the place *Providence,* because of "God's merciful providence to him in his distress." He gave the same name to his son, who was the first male child born there.

An early visitor reveals the sentiments which the people cherished, and the impressions he received:

> "This pleasant town doth border on the flood,
> Here's neighboring orchards, and, more back, the woods;
> Here's full supply to cheer our hungry souls,
> Sir Richard, strong, as well as wine, in bowls.
> Here men may soon any religion find,
> Which quickly brought brave Holland to my mind;
> For here, like there, one, with the greatest ease,
> May suit himself, or quit all, if he please."

When, many years later, a large church was built, a bell, weighing 2,515 lb., was hung in its tower. The following inscription was placed upon the bell, showing that the ancient sentiments of religious liberty still remained with the people:

> "For freedom of conscience the town was first planted,
> Persuasion, not force, was used by the people;
> This church is the eldest, and has not recanted,
> Enjoying and granting, bell, temple, and steeple."

The visitor, who can go by boat from Providence to Newport in little more than an hour, sees a change since the time, as he himself tells us, Roger Williams, starting in early morning, rowed all day till midnight to accomplish the same journey.

Providence is built on the Providence River, and around a sort of lake called "the Cove." Into this cove two small rivers, the Woonasquatucket and Moshassuck, empty. The Seekonk River is on the east side. These several rivers divide the city so as to make numerous bridges necessary. "The Cove," a mile in circuit, is surrounded by a Park. The city has a variety of surface. There is one height of 204 feet above high water. There are thus sightly locations, many of which are occupied by public buildings and beautiful private residences.

The first recorded act which reveals the early value of the oyster supplies is a vote taken on March 6, 1639, which declares "all the sea banks free for fishing." This was called for, because provisions were quite scarce, and some living by the shore seemed disposed to keep others away from the waters immediately upon their front.

The first movement which gave an exclusive right to private parties in the prosecution of fishing was on June 16, 1716. Then "Starve Goat Island" was granted, upon petition of the fishermen from Providence, for the purpose of curing and drying fish. This island is, to this day, the headquarters of a very busy trade in oysters and fish. It lies a short distance down the Providence River. In June, 1731, on the 14th, bounties were voted for whale and cod fisheries. These were to be five shillings for every barrel of whale oil, one penny for every pound of whalebone, and five shillings for every quintal of codfish brought in by Rhode Island vessels.

On Feb. 18, 1735, attention was directed to the preservation of oysters in the bay, for large quantities of them were being taken to be burned for lime. So eager were the people in procuring materials for lime, that they gathered the shells with the oysters still alive in them, and burned them. This, of course, threatened to cause wholesale destruction of the oyster beds. A law was passed putting a stop to it.

In the year 1766, on October 9, a law was made forbidding persons to take oysters by means of "drags." They were to use no instrument for this purpose but tongs, under penalty of ten pounds. Parents were also held liable for their children and servants. The owners of boats used by such as employ drags were made liable for double damages.

When the people voted upon the new Constitution proposed for the State after the famous Dorr rebellion, they felt its provisions concerning oyster protection were so indefinite they refused to adopt it. This one thing caused it to fail. Such things show how highly they valued their oyster privileges. Large numbers of families have in the past, and do so still, live on the shores of Providence and Seekonk rivers and the bay, seeking most of their substance by oystering and fishing. The growth of the city and the development of manufacturing have resulted in the destruction of the oyster beds in Providence River proper. In the memory of men now living, quantities of good oysters could be gathered above the bridges near the railroad depot. Mud and other deposits have made such changes that to find oysters you must go more than a mile below that point.

Increased demands and failure of natural supplies, here as elsewhere, prompted to efforts toward private cultivation. Robert Pettis, one of the largest dealers in the country, was a pioneer in the movement. Though partly blind from injuries received when a boy at school, he had sagacity to see the growing value of oysters and the necessity of raising them on private grounds.

Much opposition has been encountered, and, at first, a person could secure only one acre, on a lease for a limited term. Not much modification has yet been secured. But the natural beds are still failing, and the supplies from the South are becoming more costly. These are influences which are every year more pressing, and must modify the law in the letter as they already have done in the spirit.

Over 300,000 bushels of seed shells have been planted in the Providence River this spring. Parties from Boston and elsewhere are doing much to foster the enterprise. The grounds around Starve Goat Island, Bullock's Point, Sabin's Point, India Point, and the mouth of Seekonk River are very largely taken already for private beds. The prospect is that ere many years a considerable portion of Narragansett Bay will be portioned off for the purpose of cultivating oysters.

The "seed" at first raised was brought from Fire Island, on the south side of Long Island. Much is now procured up the Seekonk River and from natural beds in the bay and around Somerset, in Massachusetts.

Fair Haven, Ct., parties have been buying shells from Providence dealers for one cent and a half a bushel. They have taken them to Connecticut waters to obtain "sets." The next season they bring the shells back covered with "seed" oysters and sell to Providence men at sixty cents a bushel. This operation naturally prompts the Providence cultivators to make arrangements to obtain "seed" nearer home. They are securing beds at Freetown, Dighton, Somerset, and other places in Massachusetts. Rhode Island law is such that no shells can be carried off the beds where they are found. All gleanings beside the live oysters must be thrown back into the water where they were found. The "culling" must, therefore, be done on the beds.

For cultivating oysters, ground is selected which is a little muddy. The oysters are removed to hard bottom after two or three years. But the first three years' growth is better if there is a little mud. Thus Providence planters think. They discard the idea that deep muddy bottoms can be prepared by covering with gravel and shells. Such deposits sink through the mud at once; but living oysters will keep on the surface and manage to grow. Something in the movements or buoyancy natural to the living bivalves seems to keep them up.

Dealers have made much use of Virginia oysters for opening in cold weather. They are able to keep them alive longer in their waters than is possible on other portions of the New England coast. At most points they will die if left in the water after January.

The months of February and March seem to be trying seasons for even native oysters. Rhode Island planters think the ground goes through some change that seriously affects the oysters upon it at that time. They begin to turn black and many die.

Their beds are often injured by what is called "anchor frost." This is snowy ice that forms in the river, but because of the currents does not remain on the surface. Being carried by the streams to the bottom it catches on the beds. It kills the plants very quickly, seeming to chill them at once.

Dead sea weeds also collect on and smother the oysters. A sponge-like growth is often found, which is quite destructive also. A similar growth, of a red color, abounds and seems to feed and nourish the oysters. While the white kind kills them, the red sponge is good for them.

Five fingers, or "stars," "wrinkles," and "drills" are somewhat troublesome, but not so much so as in waters outside in Long Island Sound.

The theory of the "star" which is entertained there is as follows:

It does its destructive work mostly in the summer months. Then the oyster is growing and has a very thin and tender edge. Some of the oyster's body, a very thin slip, is in this new part of his shell. The "star," clasping his body and fingers around the oyster, breaks off some of this thin edge. Thus an opening is made for the star's stomach. He is able to make this thin enough to enter the thinnest little opening. It can go where edge of sharpest knife could not enter. Then through, his piece of his stomach he infuses gastric juice which paralyzes the oyster. He can then get in more of his stomach, open the shell, and possess himself of his prey. This he does very quickly, unless he is disturbed.

The most vexatious enemy to the cultivator, as they all claim, is what they call the "beach comber," or "barnegatter." These are persons who live around the shores, fish and dig clams, and steal oysters. Because they use iron rakes to rake or "comb" the flats for hard shell clams they are called "beach combers."

Being residents along the shores, they seem to feel that they have an inalienable right to all they can find in the water. Private ownership of sea bottom they regard as somehow abridging their natural privileges. They have apparently no compunctions in getting all they can from the cultivator's grounds. In skiffs with muffled oars, at night, they carry off whole boat loads. It is difficult to convict them, even when arrested and proven guilty. Public sentiment has always been much in their favor. If taken before a jury, some one interested in some way is very likely to be on the jury, whose course will secure a verdict for or a disagreement.

Moreover, unless one has his grounds surveyed and recorded he can really have no evidence against a depredator. The expenses attending securing and renewing leases, surveys, fees of committee, and making maps are considerable; and there must be a new survey and record each time a lease is renewed. At these renewals much expense is sometimes caused by parties bidding against each other. The law gives any resident the right to bid off such ground. Notice has to be given that application has been made for certain pieces of ground. Others who wish to object, or to make application for the same, can then be heard. This leads to rivalries and expense, as we have said. Cultivators are, however, finding it wiser to agree not to bid against each other. But a very desirable or favorably situated piece of ground is apt to excite considerable of a struggle, costing the planter much money that goes to lawyers or the State.

Against all these vexatious obstacles the business increases, because the demand for good oysters steadily increases. A change of public sentiment is gradually taking place, more favorable to the private cultivator, as the people see the value of this industry to the public at large.

Cultivation means good oysters at reasonable prices. Merely natural supplies mean inferior oysters at high prices. The oystermen are still restricted to the use of tongs or rakes to gather oysters with. The boats used are loaded down the river or bay and towed up to Providence wharves by steam tugs.

A large business is done with opened oysters as well as with those in the shell. Some Providence firms employ forty openers at a time. These are paid for their work at the rate of twelve cents a gallon of solid meats. They can earn good wages at it, one man being known to open nineteen gallons in four hours. The city, though containing over one hundred thousand people, does not use one hundredth part of the oysters raised and handled there. They are sent out through all the New England States and as far West as Toledo, O. These oyster cultivators are among the best known, substantial, and most respected business firms of the city and State. Large amounts of capital are likely to be invested in this industry during the next few years. Sagacious minds are seeing the wealth of returns that are likely to be obtained for their money cast into the sea. The facilities of communication by railroad and steamboat with even far distant places give the Providence oystermen special advantages in sending to market. Their ready sales in the future, as in the past, can only be limited by the amount they are able to produce in their waters.

Raw Oysters.

Dr. William Roberts, in an interesting series of lectures on digestive ferments, published in the *Lancet,* says: The practice of cooking is not equally necessary in regard to all articles of food. There are important differences in this re-

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spect, and it is interesting to note how correctly the experience of mankind has guided them in this matter. The articles of food which we still use in the uncooked state are comparatively few; and it is not difficult in each case to indicate the reason of the exemption. Fruits, which we consume largely in the raw state, owe their dietetic value chiefly to the sugar which they contain; but sugar is not altered by cooking. Milk is consumed by us both cooked and uncooked, indifferently, and experiment justifies this indifference; for I have found on trial that the digestion of milk by pancreatic extract was not appreciably hastened by previously boiling the milk. Our practice in regard to the oyster is quite exceptional, and furnishes a striking example of the general correctness of the popular judgment on dietetic questions. The oyster is almost the only animal substance which we eat habitually, and by preference, in the raw or uncooked state, and it is interesting to know that there is a sound physiological reason at the bottom of this preference. The fawn-colored mass which constitutes the dainty part of the oyster is its liver, and this is little else than a heap of glycogen. Associated with the glycogen, but withheld from actual contact with it during life, is its appropriate digestive ferment—the hepatic diastase. The mere crushing of the dainty between the teeth brings these two bodies together, and the glycogen is at once digested, without other help, by its own diastase. The oyster in the uncooked state, or merely warmed, is, in fact, self-digestive. But the advantage of this provision is wholly lost by cooking, for the heat employed immediately destroys the associated ferment, and a cooked oyster has to be digested, like any other food, by the eater's own digestive powers.

NATURAL HISTORY NOTES.

Fertilization of the Tulip.—Mr. W. H. Patton, writing to the *American Entomologist*, says: It has been believed that the nectar of the tulip is poisonous to bees, and that they rarely escape from the flower alive. However this may be with the yellow tulip (*Tulipa Sylvestris*), in which Kerner has described a special contrivance for excluding small insects from the nectar secreted at the bases of the filaments, it cannot be applied to our common garden tulip (*T. gesneriana*), for in this species there are neither glands to secrete nectar nor tangles of hairs to protect it, and I have never found nectar in the flowers. It is, moreover, small insects which the plant appears to attract, although the smooth cup of the perianth probably excludes crawling insects. Some of the smaller species of bees of the genus *Halticus* I have, during the past five years, observed to be frequent guests, coming for the pollen. They always alight upon either the perianth or the stigma, most frequently upon the latter, and crawling down from their alighting place to the base of the stamens, they then climb up to reach their booty. Whatever pollen they bring from other flowers has, therefore, a chance of reaching the stigma first. The perianth of the flower is red, the stigma is yellow, and the stamens—which are deeper down in the cup of the flower, and thus to a certain extent out of the line of the bee's flight—are black; and it is probable that the marked difference in the color of the stigma serves to attract the bees to the proper and most convenient landing. There appears to have been no direct observations hitherto made upon the fertilization of the tulip by insects. It may be that in the native home of the plant large insects are concerned in its fertilization, or that *T. sylvestris* thus differs from *T. gesneriana;* but Kerner's supposition that the trichomes on the filaments of *T. sylvestris* are intended to exclude small insects from the nectar, is open to doubt, in view of the observations upon the visits of small bees to the other species. A similar structure for protecting the nectar in *Geranium sylvaticum* was believed by Sprengel to serve as a shield against rain, and it may be that this is the real purpose in the tulip. Whether the supposition that the nectar of the tulip is poisonous is founded upon authenticated facts is also worthy of further investigation.

English Birds Compared with American.—Mr. H. D. Minot, in an interesting article in the August *Naturalist*, claims that after a residence of over four summer months in England, he found birds less abundant there than with us; but that, on the other hand, their companionship is more readily obtained abroad, and the naturalist need not seek for birds so often as he must in the United States, for the "respect and consideration" shown them there gives some of them, at times, almost a social ease with man, while the English public at large are more reasonable in their instincts and customs than the free and thoughtless American, who must fire his gun whenever he gets a chance, regardless of the true interests of all concerned. Wild pigeons, though heavier than ours, have a more than correspondingly slower flight; and it is curious to observe how heavy the English atmosphere seems to British birds, and how general it makes this difference in speed. The English snipe seemed to the author less quick and dashing than his American cousin, as is also the grouse; While English birds are inferior to those of New England in variety, so are they, on the whole, in coloration and in song. Among English song birds none correspond to our hermit thrush, house wren, water warbler, song sparrow, or solitary vireo. "To all England's song birds that I have heard, on the contrary, except two or three," says Mr. Minot, "we have singers corresponding; and to all absolutely, I may say without prejudice, equals or superiors, as well as I can judge." The nightingale, says he, has a voice of most wonderful compass, and is the greatest of all bird vocalists, but with a less individual and exquisite genius than our own wood thrush. The wood lark is an exquisite songster, while the note of the song thrush is exceedingly pleasing." As for the English sparrow, Mr. Minot was delighted, almost on his first day among British birds, to meet a genuine old English woman, who assured him that the year before she was "nigh heat hout of 'ouse and 'ome by them sparrows."

Vegetable Wax.

In the island of Java a species of wax is obtained from *Ficus gummiflua*, probably by drying the pith. This wax is used for lights, and is manufactured in hard lumps of a chocolate color; it becomes soft in heat, melts at 60°–70° C.; loses in boiling water its brown coloring matter, and becomes nearly white. It is partially dissolved in boiling alcohol, about one-third of it entering into solution and being deposited on cooling in a mammillated form. When treated with cold ether it separates into two parts, which are unequally soluble. These can be isolated by means of solutions in ether and by fractional precipitations after repeated and numerous additions of alcohol. The least soluble part melts at 62°, and, by analysis, it is found to have a composition which is expressed by the formula $C_{54}H_{56}O_2$. With perchloride of phosphorus it gives a chloride which is insoluble in water. The most soluble part crystallizes in a mixture of ether and alcohol, and melts at 73°. Its composition seems to be $C_{30}H_{30}O_2$. The decolorated wax, if submitted to a dry distillation, yields, among other products, a crystalline substance and an oil. The first one, if crystallized in petroleum ether, forms beautiful clusters of crystals, which melt at 67°, and form a liquid, the boiling point of which is 250° ($C_{12}H_{12}O_2$); nitric acid transforms it into a crystallizable nitrate.

Inversion of Gelatine Negatives.

M. Isard's method consists in making two layers of caoutchouc dissolved in benzine; when the first of these layers is dry he interposes a film of ordinary collodion containing about 1·5 per cent of pyroxyline, and covers it with the second layer of caoutchouc, this latter being itself again coated with a film of ordinary collodion. When this is finished, strips of the peculiar black paper called *papier à aiguilles* are glued all round the plate, so as to form a frame of the required dimensions, and the whole is then allowed to become thoroughly dry. If now it be desired to at once transfer the negative, it is only necessary to cut through the layer along the outer edge of the paper frame, and by raising one of the corners of the pellicle with the point of a knife the whole may be stripped off in one continuous movement. Provided care has been taken to let the paper get perfectly dry, the pellicle is sure to come off without its dimensions being in any way distorted. It will be seen that by nearly all similar processes we are enabled to get films which are so thin that we can, by inverting, print on either side. We can, therefore, in case of necessity, prepare for the inversion, while leaving the pellicle adherent to the glass plate on which a negative image has been taken; and when we wish to invert the negative, we have only to cut through the edges of the film as above described, and to strip it off the plate.

Moistening the Air in Mills.

To the Editor of the Scientific American:

On page 135, No. 9, current issue, Mr. L. E. Bicknell suggests the plan of moistening cotton mills with jets of steam running under the rows of looms for the purpose of moistening the warps, etc. This method has been in operation for many years (thirty years at least) here, and was always considered a success until recently, when a better plan has been adopted, which consists of pipes arranged overhead on the floor beams, and supplied with small glass sprinklers, through which, by means of an air pump (force pump), air mingled with water is forced at about twenty pounds pressure, and forms a very fine spray, which is all evaporated before it reaches the floor. This plan gives a better atmosphere for the operatives to breathe by supplying a proper quantity of oxygen to take up and purify the deadly carbonic acid gas given off their lungs. It also sweetens up the room, and there is not a foul sickening smell that steam always gives off, and the operatives are more cheerful, and there is less sickness among them since its introduction.

J. J. I.

A False Meteoric Report.

The Cleveland *Leader* states that at midnight on Saturday, August 16, Caledonia, Marion county, was visited by a terrific thunderstorm, accompanied by hail and the most vivid lightning, flash following flash in quick succession. There had been a political meeting there that evening, and the people from the neighboring villages and surrounding country were detained by the storm. Suddenly the sky appeared as bright as noonday, in fact fine print could easily have been read, so great was the light, but strange to say the light was steady, not flash after flash, as it would have been had the light been caused by lightning. A deafening roar was heard, continuing to become louder as the light became brighter. Gradually the roaring changed to a hissing, sparkling sound. It is needless to say that the people were frightened, and upon running into the street a ball of seeming fire came moving through the air from the northeast. The ball seemed to be at least twenty-five feet in diameter. As it neared the earth the heat could be plainly felt. The body struck the earth just north of the village and buried nearly one-half of itself in the ground. Good judges estimate the weight at three to five tons, but the heat is yet so great that it is uncomfortable to go nearer than thirty or forty feet. It looks like a mass of pig iron. It was visited by hundreds yesterday. The gentleman who owns the land on which it fell has been offered $300 for it.

We learn from the editor of the Caledonia (O.) *Argus* that the above statement of the Cleveland *Leader* is untrue.

ENGINEERING INVENTIONS.

Mr. Samuel L. Marsden, of New Haven, Conn., has patented an improvement in that class of crushers which operate with a reciprocating moving jaw or jaws. The invention consists in constructing a vertical jawed ore crusher with an adjustable pitman, friction driving pulleys, toggle lever, toggle, and jaw plates, arranged so as to increase the efficiency, durability, and convenience of the machine.

Messrs. Alvin R. Bailey and James B. Glass, of East Somerville, Mass., have patented packing for the piston rods of pumps, and of compressors for compressing air or chemical gases for refrigerators and ice-making, and for other uses. It is so constructed that it will not lose its pliability and usefulness from long use, and which will require only a light pressure to keep it tight, so that the piston rod may work free and cool.

An improved apparatus for increasing the production from oil wells has been patented by Mr. Charles S. Shoup, of Franklin, Pa. The object of this invention is to increase the production of oil wells by inducing and stimulating the flow from the oil rock when it falls. The invention consists in a return pipe connected with the tubes of the pump and the casing head of the well and fitted with cocks, whereby the oil may be passed to the tanks or directed through the casing head, and thence conducted down between the casing and the pump tubing alongside of the steampipe to the oil rock at the bottom of the well, for the purpose of clearing the well of paraffine.

Mr. Conrad H. Matthiessen, of Odell, Ill., has patented an improved road scraper which may be used for scraping and planing roads, and for ditching and other similar purposes. It consists in a novel arrangement of devices for raising and lowering the blade, and for adjusting it to different positions.

Ancient Man in Missouri.

The finding of numerous relics of a buried race, on an ancient horizon, from twenty to thirty feet below the present level of country in Missouri and Kansas, was noted in this paper a few months ago. The St. Louis *Republican* gives particulars of another find of an unmistakable character made last spring in Franklin county, Missouri, by Dr. R. W. Booth, who was engaged in iron mining about three miles from Dry Branch, a station on the St. Louis and Santa Fé Railroad. At a depth of eighteen feet below the surface the miners uncovered a human skull, with portions of the ribs, vertebral column, and collar bone. With them were found two flint arrow heads of the most primitive type, imperfect in shape and barbed. A few pieces of charcoal were also found at the same time and place. Dr. Booth was fully aware of the importance of the discovery and tried to preserve everything found, but upon touching the skull it crumbled to dust, and some of the other bones broke into small pieces and partly crumbled away, but enough was preserved to fully establish the fact that they are human bones.

Some fifteen or twenty days subsequent to the first finding, at a depth of twenty-four feet below the surface, other bones were found—a thigh bone and a portion of the vertebra, and several pieces of charred wood, the bones apparently belonging to the first found skeleton. In both cases the bones rested upon a fibrous stratum, suspected at the time to be a fragment of coarse matting. This lay upon a floor of soft but solid iron ore, which retained the imprint of the fibers.

Overlying the last found bones was a stratum of what appeared to be loam or sod from two and a half to three inches thick, below which was a deposit of soft red hematite iron ore, lying upon two large bowlders of hard ore standing on edge, standing at an angle of about forty-five degrees, the upper ends leaning against each other, thus forming a considerable cavity, which was filled with blue specular and hard red ore and clay, lying upon a floor of solid red hematite. It was in this cavity that the bones, matting, and charred wood were found, intermixed with ore.

The indications are that the filled cavity had originally been a sort of cave, and that the supposed matting was more probably a layer of twigs, rushes, or weeds, which the inhabitants of the cave had used as a bed, as the fiber marks cross each other irregularly. The ore bed in which the remains were found, and part of which seems to have formed after the period of human occupation of the cave, lies in the second (or saccharoidal) sandstone of the Lower Silurian.

We have received a finely illustrated 70 page catalogue of wood-working machinery issued by Messrs. Rowley & Hermance, of Williamsport, Pa. It describes a large variety of improved wood working machinery adapted to almost every imaginable use. One of the machines made by this firm is described in another column.

POSTAGE STAMP MUCILAGE.—Gum dextrin, 2 parts; water, 5 parts; acetic acid, 1 part; dissolve by aid of heat and add 1 part of spirits of wine.

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DECISIONS RELATING TO PATENTS, TRADE MARKS, ETC.

U. S. Circuit Court—Northern District of Illinois.

ADAMS *vs.* ILLINOIS MANUFACTURING COMPANY.—PATENT LANTERNS.

Blodgett, J.:

This is a bill for injunction and account. Complainant is admitted to be the owner of two letters patent issued by the United States to J. H. Irwin, the first, No. 47,551, dated May 2, 1865, and the other, No. 50,591, dated October 24, 1865, for improvements in lanterns.

The defense is want of novelty in the complainant's patents. It is admitted that defendant has made, and is making, lanterns in all respects like those described in the specifications and drawings of Irwin's patent No. 50,591. If that patent is valid, complainant must have a decree in this suit.

The leading feature of this patent is the construction of a loose-globe lantern, so arranged that the globe can be readily removed and replaced, and at the same time have the metallic parts of the frame permanently attached together so as to make a basket in which the globe will be held or retained even if the catch holding the top or dome to the frame of the lantern is unfastened. This is obtained by hinging the top or dome to the guard on one side, so that it can be closed firmly to the guard by the operation of a hinge and a catch on the side opposite the hinge, so that when the top or dome is lifted or thrown back on the hinge the globe can be removed from the guard. The conveniences of this arrangement are obvious. It makes a lantern simple in construction, with few complications, easily cleaned, and perhaps less liable to accidents than any other form of lantern which has been devised.

It is admitted that loose-globe lanterns had been made long prior to that made by Irwin in the form described in his patent. The idea of so constructing the lantern that the globe was simply held in place by the guard, and could be readily removed, was not new when Irwin entered the field; but I am satisfied that the Irwin patent can be sustained so far as its particular device is concerned. It is evidently useful, and by its application a very useful lantern is obtained.

The loose-globe lanterns which had been made prior to that of Irwin's, as shown in the proof, are:

First, Westlake, where the arrangement was such that you are obliged to remove the oil-pot, then the top, and then remove the guard from the globe. Second, Max Miller. By this the parts of the lantern can be separated by the means of springs and catches, so that finally the globe can be taken out through the top of the guard. Third, Waters' lantern. This is separated. Fourth, Evans, English patent. Fifth, Chappell, English patent. Sixth, Butterfield. Guard clasps around lantern should be called a removable guard. Seventh, Morley. Eighth, Colburn.

All these devices have some provision by which the parts of the lantern can be to a greater or less extent separated, but they none of them can, I think, be said to suggest the specific mode by which Irwin made his globe removable and preserved the connection of the parts of his frame.

Patent may be sustained as a special device, and, as defendant infringes that device, complainant must have a decree.

By the Commissioner of Patents.

EX PARTE FARNUM & CO.—TRADE MARK.—TICKINGS.

Appeal from Examiner of Trade Marks.

Marble, Commissioner:

Applicants in this case seek to register as a trade mark for ticking the word "Lancaster," accompanied by the symbolical representation of a rose.

As this case was presented in the first instance the word alone was described and claimed as constituting the one essential feature of the mark; but the registration having been refused by the Examiner upon the ground that this word was geographically descriptive, an amendment to the application was made, and the symbolical representation of a rose was also included. This amendment was held by the Examiner not to relieve the case of the previous objection, and from his unfavorable decision upon this point the present appeal has been taken.

Counsel for applicants, in support of their appeal, have urged that the action of the Examiner is erroneous for the reasons (1) that it is inconsistent with the previous practice of the Office, the word "Lancaster" being a proper trade mark, and (2) that, even admitting that the word alone is not properly registrable, this objection is avoided by the use in connection therewith of the arbitrary symbol of a rose.

Held by the Commissioner:

1. That as a rule geographical names cannot be allowed registration as trade marks.

2. That before any geographical name can be said to be registrable it must clearly appear that the place of that name is such a one that the word will be understood by the general purchasing public as primarily fanciful, and that manufacturers of like goods at such place cannot so mark their wares and claim the protection of our laws.

3. That the essential features of a trade mark are those only which serve in whole or in part to distinguish the goods of the party by whom such mark is adopted, and it is not proper that anything should be described as essential which the courts would hold otherwise; and

4. That words calculated to deceive the public as to the place of manufacture should not be allowed registration.

The decision of the Examiner of Trade Marks is accordingly affirmed.

U. S. Circuit Court—District of Massachusetts.

CROWELL *vs.* PARMENTER.—CURING AND PUTTING UP FISH.

Where, in his contract with the defendant, the plaintiff agreed that he would sell no licenses for less than a certain price, and it conclusively appears that he has broken such agreement in a way calculated to injure the defendant, a preliminary injunction will be denied, notwithstanding the fact that the defendant has admittedly failed to pay his stipulated royalty.

The motions in this case and several others (No. 944*a*, *vs. George G. Tarr;* No. 945, *vs. George W. Adams;* No. 945*a*, *vs. Sylvanus Smith;* No. 946, *vs. Charles H. Pew;* No. 946*a*, *vs. James G. Tarr;* No. 947, *vs. J. J. Stanwood;* No. 947*a*, *vs. James L. Shute;* No. 948, *vs. Charles G. Cressey*, and No. 948*a*, *vs. Samuel Lane*) are founded on the same patent for curing and putting up fish which is relied on in *Crowell vs. Harlow.*

In the cases now under consideration the several defendants had, as tenants in common, an exclusive license or grant, which, as they contend, gives them full power to use the invention to the end of the term. They admit a failure to pay the royalties agreed on, but contend that the license is not conditional, and that no right of resuming his grant has been reserved to the plaintiff, but that he must bring his action at law for the royalties, or his suit in equity for an account of those royalties, from time to time as he may be injured—a different and less stringent remedy than that which is sought by this bill.

I shall not discuss this issue at the present time. I shall assume that, under the frame of the bill, the plaintiff can have some remedy in this court as well as in a court of law. The reason why I refuse this preliminary and peremptory injunction moved for is that by the contract between the parties, and as a part of it, in consideration of the agreements on the part of the defendants, the plaintiff agreed that he would sell no licenses for less than a certain price, and there are numerous affidavits which declare that he has sold such licenses for a very much smaller consideration, and in a way which seemed intended to deceive the defendants, and which would seem calculated to injure them in their exclusive rights. These affidavits are wholly uncontradicted, and must be taken at this hearing to be true. Under these circumstances a court of equity cannot lend its most stringent remedy to the plaintiff in advance of the trial or hearing at which the accounts and damages may be properly adjusted between the parties.

Motion denied.

The Great Steamship City of Rome.

At the recent meeting of the Institution of Mechanical Engineers, Barrow-in-Furness, an interesting paper, from which we take the following, was read by Mr. James Humphrys, on the Inman steamship City of Rome, now in course of construction by the Barrow Shipbuilding Company. We hope in an early number to publish Mr. Humphrys' paper in its complete form, with diagrams, but in the meantime we may give some of the leading particulars of the vessel to which it relates. This splendid steamer will, when completed, be the largest vessel afloat, with the exception of the Great Eastern. Her dimensions are: Length between perpendiculars, 546 feet; length over all, 600 feet; extreme breadth, 52 feet 3 inches; and depth of hold, 37 feet. She will have staterooms for 271 passengers, and accommodation for 1,500 emigrants, provision being made for carrying about 260 emigrants at the fore end and 240 at the aft end on the main deck, and for 1,000 more on the lower deck. The grand dining saloon is 72 feet long, 52 feet wide, and 9 feet high, or 17 feet in the way of the large opening through the drawing room above; this saloon will afford accommodation for dining 248 persons at once. The estimated weight of the City of Rome complete and ready for sea is 8,000 tons, while her displacement on 28 feet mean draught is 13,500 tons, so that she will have a dead weight-carrying power of 5,500 tons. Her holds, however, have a cubical capacity of 38,600 cubic feet, equivalent to 7,720 tons measurement at 50 cubic feet per ton.

In the constructive details of the City of Rome every endeavor has been made to insure strength combined with high-class accommodation. The hull is divided into water-tight compartments by a number of bulkheads, the maximum of any one of these compartments being about 60 feet. All the bulkheads are fitted with water-tight doors of the Admiralty pattern, worked either from above or below, and provided with tell-tales on deck. At the fore end a double bottom is provided for a length of about 150 feet from the stern to give greater safety in the event of stranding. The framing is of the ordinary type. The vessel has two complete iron decks above, while the lower deck is complete for half its length, and has wide side plating for the remainder. There are nine tiers of keelsons running fore and aft, the five central ones being of uniform height, and being carried unbroken through engine and boiler rooms. The stern frame, which is now being made at the Mersey Steel and Iron Works, is estimated to weigh 33 tons when finished, and will be the largest single forging of its kind ever made.

The City of Rome will have a single screw, 24 feet in diameter, driven by three sets of compound engines of the inverted tandem type, these engines actuating cranks set at 120°. Each engine has a high-pressure cylinder 43 inches, and low-pressure cylinder 86 inches in diameter, the stroke being 6 feet. The high-pressure cylinder is supported above the corresponding low-pressure cylinder by three wrought iron columns, the arrangement giving ready access to the stuffing boxes, etc. The cylinder covers are made in halves for easy removal. The valve faces are on the fronts of the cylinders, the valves being driven by eccentrics on an independent shaft coupled to the main shaft at each end by a pair of mortise wheels. The crank-shaft is a built-up shaft, and is being made by Sir Joseph Whitworth & Co., of their compressed steel. It will weigh complete 64 tons, and will have main bearings 25 inches in diameter by 33½ inches long, and crank-pins 26 inches in diameter by 28 inches long. The screw shafting is also being made of the Whitworth compressed steel, and will be hollow. The intermediate shafting is 24 inches in diameter, with a 14 inch hole through it, while the propeller shaft is 25 inches in diameter by 30½ feet long, and will weigh 18 tons. The thrust shaft will weigh 17 tons, and will have 13 collars 39½ inches in diameter, giving a surface of 6,000 square inches. The engine bed plate will weigh 100 tons. The surface condensers contain nearly 17 miles of tubing, exposing 17,000 square feet of surface, and the condensing water will be supplied by two double-acting circulating pumps, 26 inches in diameter, with 3 feet stroke, worked by the forward and aft engines respectively, as are also the bilge and feed pumps, and the air pumps, the latter being 39 inches in diameter, with 3 feet stroke. There are also a large centrifugal pumping engine (for pumping heavy leaks, and which can be arranged to discharge through the condensers), and three auxiliary pumping engines for boiler feeding, bilge pumping, etc.

The boilers are eight in number, arranged in two boiler rooms of moderate size separated by a water-tight bulkhead. The boilers, which are of the cylindrical double-ended type, 14 feet in diameter by 19 feet long, are arranged fore and aft in four blocks of two each, the two central blocks being separated by the transverse bulkhead just mentioned. The coal bunkers are along the sides of the ship and form part of the structure; it is intended to make these bunkers and keelsons water-tight so as to constitute the inner skin at the points where they occur. Each boiler has six furnaces, 3 feet 9 inches in diameter, and with separate combustion chambers. The fire grates are 6 feet long, the total area being 1,080 square feet. Each boiler has a steam receiver, 13 feet long by 4 feet diameter. The furnaces and combustion chambers are of Bowling iron, and the shells of iron made by Sir John Brown & Co., the plates being 24 feet 8 inches long by 4 feet 4½ inches wide and 1¼ inches thick, the weight being nearly 2½ tons each. The boilers are made for a working pressure of 90 pounds per square inch.

The engines are intended to develop in regular work 8,000 indicated horse power, but to be capable of developing 10,000 horse power. The speed expected is 18 knots per hour. The vessel will have four masts, and will be full ship-rigged, with the addition of the fore and aft rigged jigger mast; she is expected to be ready for service next summer, and will ply between New York and Liverpool.

Steam Cable Towing on Erie Canal.

Notice was taken a few weeks since of a protest by certain boat owners and others against the use of the steam cable towing system on Erie Canal. The charges entered against the system, especially with reference to its inconvenience and unprofitableness, do not appear to be well supported by fact. At any rate, the traffic of the canal so far this year has been uncommonly large, and much of the increase is attributed to the speedy and economical cable service.

The official returns received at the Produce Exchange show the total movement on the canals since they were opened until August 14, to be fully 30 per cent greater than for the same period last year, as follows:

	1879.	1880.
Total tons	2,210,450	3,258,896
Total miles boats cleared	3,093,725	5,325,649
Total tolls	$343,537	$504,259

Seven hundred boats have abandoned the old system of towing and adopted the new; and it is claimed that the increase of speed secured by the cable has increased the capacity of the canal fully 15 per cent. At the same time the boat owners, through the more rapid movement of their cargoes and more frequent trips, have been able to make larger profits, and the revenue of the State has been materially augmented. If no serious breaks occur in the canal it is expected that the toll-sheet at the end of the season will show a revenue far in excess of anything recorded heretofore.

The Dying Fish of Lake Ontario.

Notice was recently taken in this paper of the wholesale destruction of fish, supposed to be young land-locked shad, in Lake Ontario. Mr. Seth Green, Fish Commissioner, says that they are a different fish, belonging to another branch of the shad family. They appear to be very prolific, and travel in schools so large that all are unable to find food. Those at the head of the schools pick up all the food, and those behind starve to death. Mr. Green says he has picked up and examined hundreds of them. They are but little more than skin and bones, and have nothing whatever in their stomachs. The same fish have also appeared in Cayuga Lake, but are not as large as those of Lake Ontario. During a recent visit to the former lake he observed a school feeding. He followed in their wake, as he had done before in Lake Ontario, and picked up several not yet dead, and found they were dying from starvation. They have made their appearance in both Seneca and Cayuga lakes, and it is a mystery how they got there. In order to get to these lakes from Lake Ontario—that is, if they come that way—there are several dams which it would seem impossible for them to get over.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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Inventors wishing Premium Lists of the N. Y. State Fair, free by mail, address Lingenfelter & Co., Patent Sellers, Publishers of *Patent Herald*, Amsterdam, N. Y.

Wanted.—Address of Parties Making Rolls for Leveling Half-inch Iron. W. H. Butler, 291 Broadway, N. Y.

Wanted.—Second-hand Hydraulic Press, 600 to 1,000 tons capacity. E. R. H., Cooley's Hotel, Springfield, Mass.

Fine Gray Iron Castings to order. A. Winterburn, Foundry, 16 DeWitt St., Albany, N. Y.

Wanted, first-class large Planer, new or second-hand. Address Lambertville Iron Works, Lambertville, N. J.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 140.

2d-hand Machinists' Tools, Lathes, Planers, and Drills, for sale. Address Hawes Machine Co., Fall River, Mass.

Recipes and Information on all Industrial Processes. Park Benjamin's Expert Office, 50 Astor House, N. Y.

Dish Washing Machine wanted; one that is capable of washing 25,000 daily. A liberal offer will be made any party possessing such a machine, by addressing D. W. M., Box 773, New York city.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Apply to J. H. Blaisdell for all kinds of Wood and Iron Working Machinery. 107 Liberty St., New York. Send for illustrated catalogue.

Our new Stylographic Pen (just patented), having the duplex interchangeable point section, is the very latest improvement. The Stylographic Pen Co., Room 13, 169 Broadway, N. Y.

Advertising of all kinds in all American Newspapers. Special lists free. Address E. N. Freshman & Bros., Cincinnati, O.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Sweetland & Co., 126 Union St., New Haven, Conn., manufacture the Sweetland Combination Chuck.

Power, Foot, and Hand Presses for Metal Workers. Lowestprices. Peerless Punch & Shear Co., 52 Dey St., N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Split Pulleys at low prices, and of same strength and appearanceas Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Peck's Patent Drop Press. See adv., page 140.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 147.

Burgess' Non-conductor for Heated Surfaces; easily applied, efficient, and inexpensive. Applicable to plain or curved surfaces, pipes, elbows, and valves. See p. 284.

Eclipse Portable Engine. See illustrated adv., p. 125.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

Blake "Lion and Eagle" Imp'd Crusher. See p. 141.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 142.

Saw Mill Machinery. Stearns Mfg. Co. See p. 141.

Improved Solid Emery Wheels and Machinery, Automatic Knife Grinders, Portable Chuck Jaws. *Important*, that users should have prices of these first class goods. American Twist Drill Co., Meredithville, N. H.

For Standard Turbine, see last or next number.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

The $4 Drill Chuck sent free on receipt of price. A. F. Cushman, Hartford, Conn.

Machine Diamonds. J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

4 to 40 H P. Steam Engines. See adv. p. 125.

Wanted—The address of 40,000 Sawyers and Lumbermen for a copy of Emerson's Hand Book of Saws. New edition 1880. Over 100 illustrations and pages of valuable information. Emerson, Smith & Co., Beaver Falls, Pa.

For Separators, Farm & Vertical Engines, see adv. p. 157.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 157.

For Wood-Working Machinery, see illus. adv. p. 157.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 157.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

For Patent Shapers and Planers, see ills. adv. p. 156.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 78.

Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Circulars on application. Pittsburg Steel Casting Company, Pittsburg, Pa.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 157.

C. J. Pitt & Co., Show Case Manufacturers, 226 Canal St., New York. Orders promptly attended to. Send for illustrated catalogue with prices.

Catechism of the Locomotive, 625 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

Elevators.—Stokes & Parrish, Phila., Pa. See p. 157.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Large knife work a specialty. Also manufacturers of Soloman's Parallel Vise. Taylor, Stiles & Co., Riegelsville, N. J.

Penfield (Pulley) Blocks, Lockport, N. Y. See ad. p. 157.

Lightning Screw Plates and Labor-saving Tools, p. 108.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) F. W. L. asks if there is any way to test for gold as an alloy of other metals, and if so, what? A. Rub the alloy upon a piece of hard slate (the touchstone used by jewelers is better), warm the stone and moisten it with strong nitric acid. If the metallic streaks do not disappear gold is present in the alloy.

(2) J. A. G. writes: 1. In making a dynamo-electric machine, half the size of the one described in SUPPLEMENT No. 161, what Nos. of wires should be used? The Nos. given are 16 and 18. A. Use Nos. 18 and 20. There is no object in making a dynamo machine smaller than the one referred to. 2. Is there any process by which the melting point of paraffine may be raised, leaving it tasteless and inodorous? A. We know of no way. 3. Are celluloid collars, etc., injurious or poisonous to the wearer? Dealers here say so, but I think only because they wish to discourage the use of celluloid goods. A. They are not considered poisonous.

(3) V. V. S. writes: I wish to drill a hole one-quarter inch in diameter through a piece of 21-ounce glass. How can I do so without breaking it? A. It can be done by means of an ordinary steel drill hardened in mercury, and moistened while drilling with turpentine containing a little gum camphor. A safer way, however, is to use a one-quarter inch copper tube as a drill, and apply emery and oil or water to it as it revolves.

(4) O. & G. ask: 1. For a cheap substitute for shellac varnish. Is there another solvent for shellac, besides alcohol, that will answer as a varnish, and which will dry moderately quick? A. Shellac is soluble in alcohol, wood naphtha (crude methylic alcohol), in aqueous solution of borax (borax 1, shellac 6), and to some extent in strong ammonia water. 2. What is the most practical book with receipts for staining woods, making cheap varnishes, etc. A. You should address the bookdealers who advertise in these columns for their catalogues, etc.

(5) A. R. C. asks: 1. Would a square foot of cold iron be larger or smaller if heated to 4,000° or 5,000° Fah.? A. It would occupy less space. 2. Why is it that a piece of solid iron will float on a ladle of melted iron? A. For the same reason that ice floats on water. See p. 116, *et seq.*, Tyndall's "Forms of Water." 3. What are the relative amounts of carbon in cast iron, wrought iron, and steel? A. Cast iron, 2·0 to 5·0 per cent; wrought iron, 0·1 to 0·25; steel, 0·15 to 5·5. 4. Is there more carbon in hard cast iron than in soft? A. Yes.

(6) J. W. writes: 1. I should like to know how to make a sample of strong nitric acid, 48°, for nitro-sulphuric. I took all the moisture I could out of nitrate of soda, and used sulphuric acid at 62°, but could not get any stronger than 44° nitric; perhaps I may have used too much sulphuric acid; namely, equal quantity to nitrate. A. Dry the nitrate thoroughly, use strong sulphuric acid, and do not overheat or force the distillation or drive it too far. See Mowbray's "Trinitroglycerine." 2. Also how to make a pure sample for chemical purposes, as it is too red? A. Redistill at a gentle heat, rejecting the first and last portions.

(7) W. C. B. asks if there is anything that will render canvas fireproof. I am making an awning for steam launch, and she throws sparks so badly as to burn the awning. Would it be practicable to get an asbestos awning, and would it be very expensive? A. Saturate the awning with a strong aqueous solution of tungstate of soda (comml.). Asbetos cloth is rather expensive.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

August 10, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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Plans of the grounds and other necessary details may be had on application at the office of the Superintendent of the Exchange, or by addressing him to care of lock box N, New Orleans post office.
Each design to be accompanied by a clear and condensed written description of drawings and the proposed material of construction, under seal, and a sealed letter, giving address of the author, the name of the party offering the design not to appear on the drawings or to be attached to the description.
Perspectives will not be received, and all drawings must be in line at a scale of one-sixteenth of an inch for the ground plan and one-eighth for the elevation.
A sum of $500 will be paid for the plan adopted, the committee reserving the right to reject any and all drawings. The design accepted to be the property of the New Orleans Cotton Exchange.
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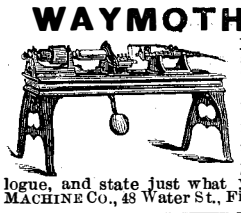
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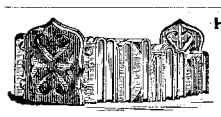
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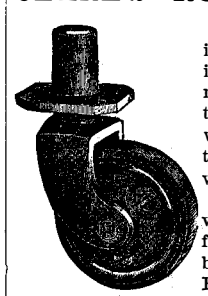
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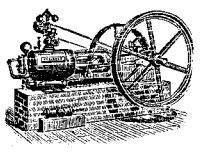

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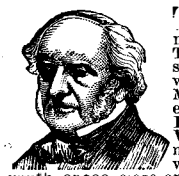

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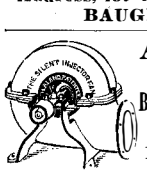

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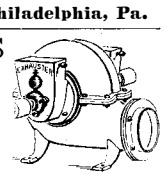

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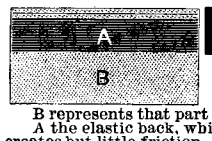

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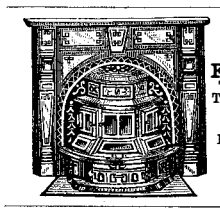

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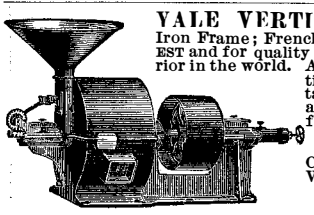

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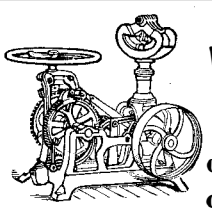

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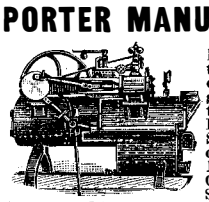

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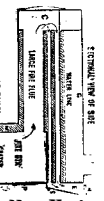

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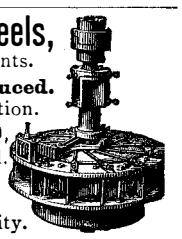

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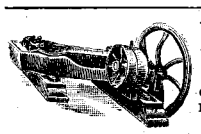

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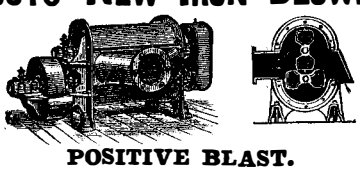

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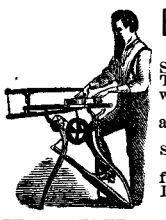

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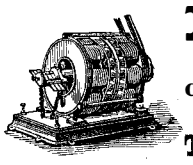

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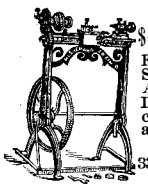

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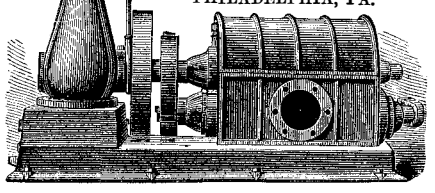

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